



# **Washington State Department of Transportation**

## **Vancouver HOV Lane Pilot Project**

### ***Evaluation Report #5***

*Prepared by:*

**Parsons Brinckerhoff Quade and Douglas**

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## Glossary

**Auto Occupancy.** The number of persons per non-transit vehicle.

**Vehicle Occupancy.** The number of persons per vehicle, including transit vehicles.

**GP Lane: General Purpose Lane.** A travel lane that is open to all vehicles.

**HOV Lane: High Occupancy Vehicle Lane.** A travel lane limited to vehicles carrying more than one person. The I-5 HOV lanes require a minimum of two persons per vehicle. Some HOV lanes require a minimum of three persons per vehicle.

**Peak Hour.** For this report, the peak hour is defined as the one-hour increment carrying the greatest number of vehicles. The peak hour could also be defined as the one-hour increment carrying the greatest number of persons. The peak hour was 6:15-7:15 AM for the Baseline, November 2001, and March 2002 reporting periods. The peak hour shifted to 6:00-7:00 AM during the July 2002 and October 2002 reporting periods. The peak hour shifted to 7:00-8:00 AM during the April 2004 reporting period.

**Peak Period/Two-Hour Period.** For this report, the peak period or two-hour period is defined as the two-hour increment during which the HOV lane is operational (6:00 – 8:00 a.m.). The peak period is the period of time (1-3 hours typically) with the greatest number of vehicles or the greatest number of persons.

**Variable Message Sign (VMS).** An electronic sign displaying current travel information. A VMS can display construction status, general traveler information, delays, and safety information.

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## VANCOUVER HOV PILOT PROJECT EVALUATION REPORT #5

### KEY FINDINGS AND CONCLUSIONS TO DATE

- € Of the eight HOV goals established for this specific project, the Vancouver HOV pilot project is meeting five goals. The pilot project is meeting Goals 3, 4, 5, 6, and 7. The pilot project is not meeting goal 1. Goal 2 contains two components. The pilot project is meeting one of the two components. No recent data has been collected to determine whether Goal 8 is being met.
1. Move more people per lane in the HOV lane during the AM 2-hour period than in either of the adjacent general-purpose lanes.
    - Ø The Vancouver HOV lane is not currently carrying more people per lane than either of the adjacent lanes. In Evaluation #5, person volumes in the HOV lane averaged 76% of the adjacent general purpose lane average during the 2-hour peak period. The peak hour HOV person volumes increased to 76% of the general purpose lane average. The ability of the HOV lane to carry more people is constrained by the level of bus service and park-and-ride spaces provided along the corridor. This artificial cap may not be remedied for another year until the 99<sup>th</sup> Street Park-and-Ride facility is open.
    - Ø The Vancouver HOV lane has contributed to I-5 carrying more people in fewer vehicles compared to the Baseline.
  2. Reduce peak period travel time for HOV lane users and reduce the average per-person travel time for all users.
    - Ø Goal 2 contains two components. First, peak period and peak hour travel times for HOV lane users have been reduced since the Baseline reporting period. Second, average per-person travel times for all users have increased during the peak period and peak hour travel periods compared to the Baseline reporting period.
  3. Minimize impacts to other traffic in the corridor and on parallel facilities.
    - Ø Compared to the Baseline, the share of traffic on I-205 increased slightly. The share of traffic on Highway 99, Hazel Dell Avenue, and Lakeshore Drive decreased slightly. For all evaluations, the share of traffic on Main Street increased compared to the Baseline, but much of the increase is likely attributable to the completion of construction at the Main Street interchange in October 2001, after the Baseline data were collected.
  4. Increase the use of carpools, vanpools, and transit.
    - Ø The number of carpools and transit ridership has increased since the Baseline reporting period.
  5. Maintain safety by not increasing the accident and incident rate in the corridor during HOV lane operating periods.
    - Ø The number of on-roadway and off-roadway incidents has fluctuated during each reporting period. Based on this data, it could be implied that the HOV lane has not negatively impacted corridor safety.
  6. Maintain the HOV lane's effectiveness with appropriate enforcement.

- Ø The 2-hour period violation rate was 5 percent during the November 2001, March 2002, and October 2002 reporting periods. The violation rate increased to 11 percent during the April 2004 reporting period. WSP reduced lane enforcement after the October 2002 reporting period and has only sporadically provided an enforcement presence. In other regions, a correlation exists between the level of enforcement and the violation rate. The lack of regular enforcement is likely contributing to the increased violation rate.
  - Ø The peak hour violation rate decreased from 5 percent in November 2001 to 4 percent in March 2002. From March to July, the peak hour violation rate increased to 8 percent. The peak hour violation rate dropped to 5% during the October 2002 period. The peak hour violation rate increased to 11% during the April 2004 period. As noted above, WSP reduced lane enforcement after the October 2002 reporting period and has only sporadically provided an enforcement presence. In other regions, a correlation exists between the level of enforcement and the violation rate. The lack of regular enforcement is likely contributing to the increased violation rate.
  - Ø The national violation rate average is in the 10-15% range. The Portland HOV lane has a violation rate of 10%, which is also within the national guidelines. The Vancouver lane has a violation rate of approximately 11%, which is within acceptable guidelines.
7. Maintain or improve travel time reliability for carpools, vanpools, and transit.
- Ø Travel times during the Two-Hour Period for C-TRAN Route 134 have decreased compared to all prior reporting periods. Route 134 provides express service from the Salmon Creek Park-and-Ride facility to downtown Portland. This route carries the vast majority of transit riders using the HOV lane.
  - Ø Travel times during the Peak Hour for C-TRAN Route 134 have increased compared to most prior reporting periods.
  - Ø The Vancouver HOV lane is maintaining at least 45 mph along its entire length both during peak hours and overall during the two-hour period.
8. Maintain or improve public opinion as to the effectiveness of HOV lanes.
- Ø Public opinion polling was not conducted for this evaluation report. As a result, it cannot be determined whether Goal 8 is being met. Three public opinion surveys were conducted concurrent with prior evaluation reports.
  - Ø WSDOT received less than 15 comments during the past 18 months (January 2003 to June 2004). The comments were received via e-mail and phone calls. All comments received were negative. Comments received were generally from GP lane users concerned about the perceived lack of HOV lane usage and the HOV lane violation rate.

# Vancouver HOV Pilot Project Evaluation Report #5

## PURPOSE

On October 29, 2001, a new High Occupancy Vehicle (HOV) lane opened on I-5 between 99th Street and Mill Plain Boulevard. The lane is reserved for vehicles with two or more passengers (carpools, vanpools and buses) as well as motorcycles. The HOV lane is accessible throughout its entirety allowing HOVs to enter and exit as needed. The HOV lane hours of operation are from 6 to 8 a.m. during the weekday morning commute. The lane is open to all traffic at all other times.

This report is the fifth in a series of evaluation reports that monitor the effectiveness of the Southbound I-5 High Occupancy Vehicle (HOV) Lane Pilot Project that opened to traffic on October 29, 2001. Data was collected by various agencies both before and after the Vancouver HOV lane was implemented. Information contained in this report will compare the April 2004 information to the baseline information (September 2001) contained in the Baseline Report completed by WSDOT and the consultant team. The report also compares the April 2004 post opening data against the November 2001, March 2002, July 2002, and October 2002 post opening information.<sup>1</sup> The initial evaluation reports from 2001 and 2002 were prepared quarterly to closely track lane usage during the first year of operation. Traffic patterns vary seasonally (e.g. school schedules, vacation travel) and it can be expected that observed corridor data will correspondingly vary across evaluation periods.

When opened in November 2001, the Vancouver HOV lane hours of operation were 6 to 9 AM. Evaluation Report #1 found Vancouver HOV lane usage to be most heavily concentrated in the first two hours of operation with a drop in usage during the third hour. Based on the usage data, the Vancouver HOV lane hours of operation were reduced by one hour to 6 to 8 AM. The new hours of operation took effect January 14, 2002. The Baseline Report and Evaluation Report #1 were prepared assessing the 6 to 9 AM period. To ensure consistent comparison across reporting periods, the data from those reports was updated to reflect the new 6 to 8 AM operating period.

**Figure 1** shows the Vancouver HOV lane corridor as well as traffic count and monitoring locations.

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<sup>1</sup> Baseline report data were collected in May and September 2001. Evaluation Report #1 data were collected in November 2001. Evaluation Report #2 data were collected in March 2002. Evaluation Report #3 data were collected in July 2002. Evaluation Report #4 data were collected in October 2002. Evaluation Report #5 data were collected in April 2004.



Figure 1. Vancouver HOV Lane and Count/Monitoring Locations



## VANCOUVER HOV LANE GOALS

The goals of the Vancouver HOV Lane Pilot Project are:

1. **Move more people per lane** in the Vancouver HOV lane during the AM 2-hour period **than in either of the adjacent general-purpose lanes**.
2. **Reduce peak period travel time for HOV lane users** and **reduce the average per-person travel time for all users**.
3. **Minimize impacts to other traffic** in the corridor and on parallel facilities.
4. **Increase the use of carpools, vanpools, and transit**.
5. **Maintain safety** by not increasing the accident and incident rate in the corridor during HOV lane operating periods.
6. **Maintain the HOV lane's effectiveness with appropriate enforcement**.
7. **Maintain or improve travel time reliability for carpools, vanpools, and transit**.
8. **Maintain or improve public opinion as to the effectiveness of HOV lanes**.

## EVALUATION (PERFORMANCE) MEASURES

An Interagency Team, comprised of representatives from the Washington State Department of Transportation (WSDOT), C-TRAN, the City of Vancouver, Southwest Washington Regional Transportation Council (RTC), Oregon Department of Transportation (ODOT), and Metro, established the following performance measures to be used to evaluate the Vancouver HOV Lane Pilot Project:

**Operations** – total persons using the corridor, travel times (HOVs, Single Occupant Vehicles [SOVs], and freight), safety, enforcement, traffic impacts to parallel routes, and traffic operations at the beginning and ending transitions.

**Modal Impact** – HOV lane utilization, transit ridership, increase in transit service, number of persons per vehicle, Park-and-Ride use, vanpool use, and employer programs.

**Public Opinion** – Public perceptions of success. This will include survey results, phone calls, internet comments, etc.

This report is the fourth post-HOV opening evaluation report and describes the baseline and post-HOV lane opening conditions for each of the Vancouver HOV lane goals.

## DATA COLLECTION METHODOLOGY

Before and after traffic count data were collected from WSDOT, City of Vancouver, RTC, and Clark County. Bus passenger counts were collected by C-TRAN. The consultant team performed travel time runs as well as vehicle occupancy counts using standard and nationally accepted data collection techniques. A WSDOT incident response vehicle patrols the I-5 corridor during the AM peak period. The vehicle has been collecting corridor travel time data on a regular basis since December 2001. Travel time data is summarized under the Goal 2 summary.

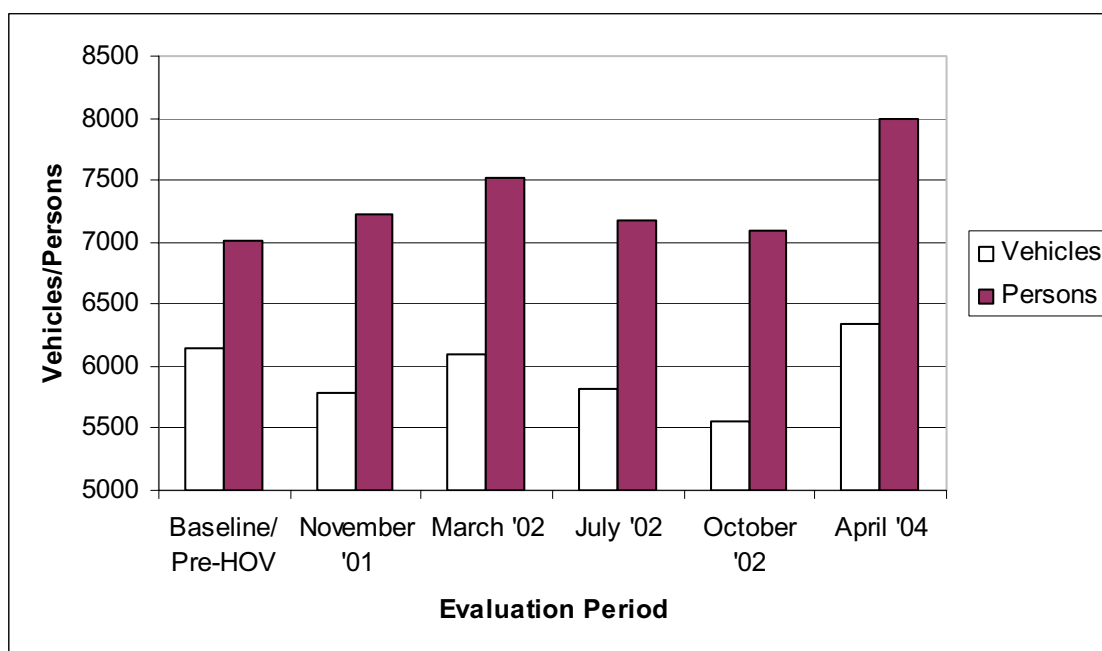
Vehicle occupancy counts consisted of counting every vehicle in a single lane for 15-minute intervals and noting the number of occupants in each vehicle. The occupancy counts rotated across all lanes. Bus ridership was determined using C-TRAN counts provided for those routes using the I-5 corridor on the same dates that vehicle occupancy counts were taken. Percentages of the number of vehicles and persons for each travel mode were then applied to traffic counts, taken for each lane, by WSDOT's automated traffic recorders that provide continuous traffic counting. Appendix B contains a description of the data collection process for travel time runs.

## HOV LANE GOALS

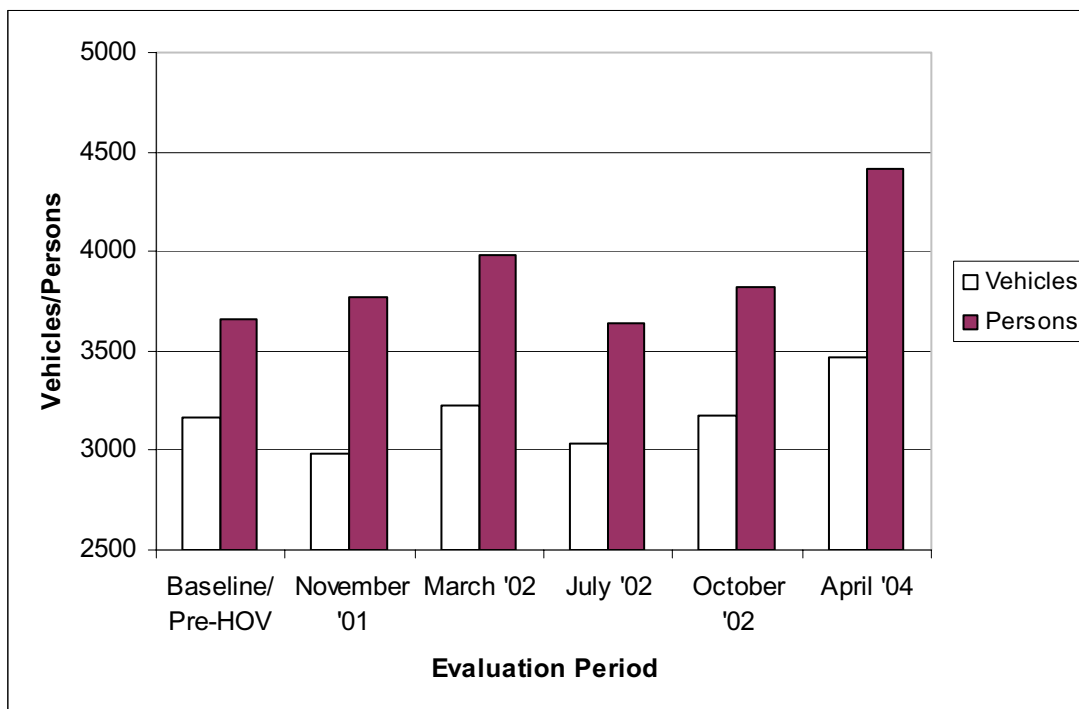
### Goal 1. Move more people per lane in the Vancouver HOV lane during the AM 2-hour period than in either of the adjacent general-purpose lanes.

This measure is the total number of persons traveling the corridor during the AM peak hour or period. **Figures 2 and 3** show the total number of person trips (sum of persons per lane) based on counts taken in May 2001 (vehicle occupancies) and September 2001 (counts) for the Baseline Report. Post opening vehicle occupancy and vehicle counts are listed for November 2001, March 2002, July 2002, October 2002, and April 2004. A table summarizing person and vehicle trips for all reporting periods is included in Appendix A. **Table 1** shows the number of persons per lane, measured near 33<sup>rd</sup> Street, for the three through traffic lanes in that section. **Figure 4** shows the number of persons using the HOV lane as a percentage of the average number of persons using the adjacent general purpose lane.

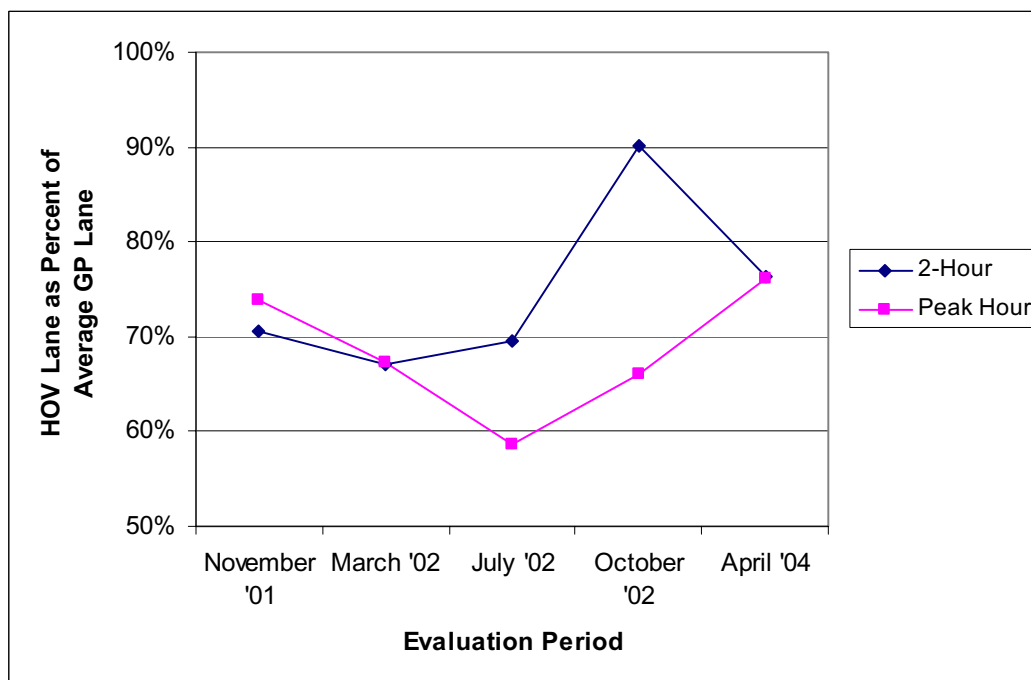
**Figure 2. Total Person & Vehicle Trips: 6-8 AM**



Measured near 33<sup>rd</sup> Street for the three through traffic lanes.

**Figure 3. Person & Vehicle Trips: Peak Hour**

Measured near 33<sup>rd</sup> Street for the three through traffic lanes

**Figure 4. HOV Persons as a percent of adjacent GP lane persons**

Measured near 33<sup>rd</sup> Street

Table 1. Persons Per Lane

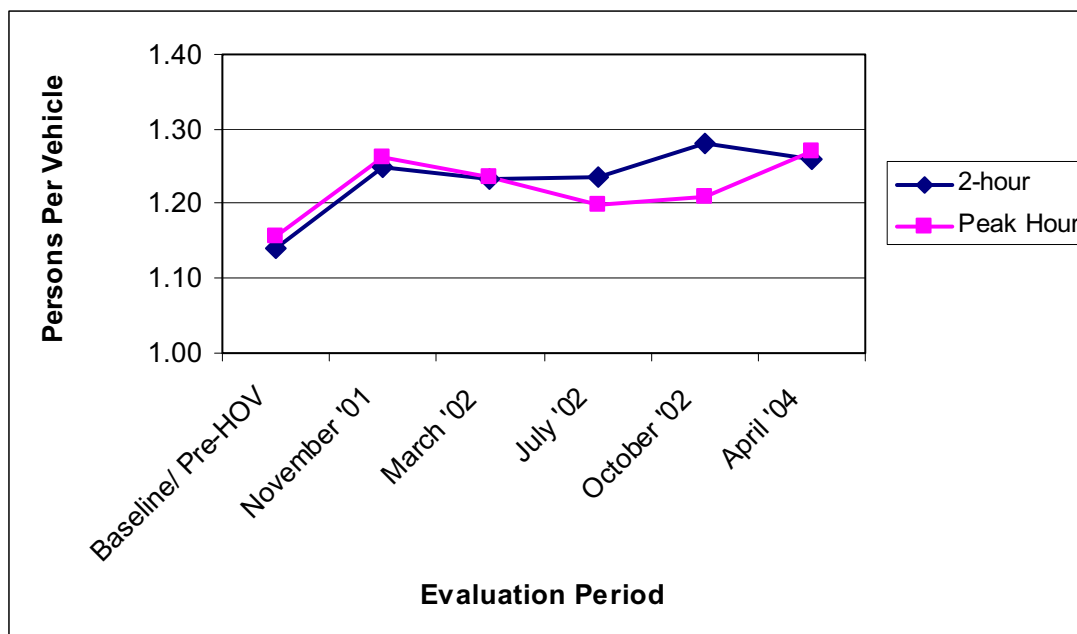
Measure	Baseline (September 2001)	After HOV Opening (November 2001)		After HOV Opening (March 2002)		After HOV Opening (July 2002)		After HOV Opening (October 2002)		After HOV Opening (April 2004)	
	All Lanes	HOV Lane	Each GP Lane	HOV Lane	Each GP Lane	HOV Lane	Each GP Lane	HOV Lane	Each GP Lane	HOV Lane	Each GP Lane
Two-hour count (6-8 AM)	2,337	1,885	2,668	1,888	2,817	1,854	2,662	2,205	2,447	2,209	2,890
Peak hour count	1,220	1,016	1,376	1,003	1,489	824	1,407	949	1,438	1,215	1,598

Measured near 33<sup>rd</sup> Street for the three through traffic lanes.

GP Lane = General Purpose Lane

**Figure 5** shows average vehicle occupancy (all persons using the corridor divided by the total number of vehicles). Average vehicle occupancy reflects person trips occurring in all modes of travel on I-5. Detail occupancy data is provided in Appendix A.

**Figure 5. Vehicle Occupancy**



Based on measurements taken near 33<sup>rd</sup> Street.

Vehicle occupancy is total persons in all vehicles (including transit) divided by the total number of vehicles.

## Findings To Date

- € The number of vehicles and number of persons using the corridor has increased compared to all prior reporting periods. The increase is consistent with data collected by WSDOT from the period between the October 2002 and April 2004 evaluation reports. The initial evaluation reports from 2001 and 2002 were prepared quarterly to closely track lane usage during the first year of operation. Traffic patterns vary seasonally (e.g. school schedules, vacation travel) and it can be expected that observed corridor data will correspondingly vary across evaluation periods.
- € Person volumes in the HOV lane averaged 76% of the adjacent general purpose lane average during the 2-hour peak period. This number has remained nearly constant across all reporting periods except the October 2002 period.
- € The peak hour HOV person volumes are 76% of the general purpose lane average. This represents an increase compared to the October and July 2002 reporting periods and a decrease compared to the March 2002 reporting period.
- € Bus ridership on I-5 routes has increased from 499 two-hour-period riders before the Vancouver HOV lane opened to 691 two-hour period riders (April 2004 volumes) after the Vancouver HOV lane opened. This ridership level is consistent with the October 2002 reporting period. The Salmon Creek park-and-ride facility has operated at capacity since the HOV lane opened and no additional park-and-ride or transit service capacity has been added to the corridor during the prior 2 years. The ability of the HOV lane to

carry more people is constrained by the level of bus service and park-and-ride spaces provided along the corridor. This artificial cap may not be remedied for another year until the 99<sup>th</sup> Street Park-and-Ride facility is open.

- € During the November 2001, March 2002, July 2002, October 2002, and April 2004 evaluation periods, the Vancouver HOV lane was not carrying more persons per lane than either of the adjacent general-purpose lanes. This is largely because park-and-ride lot capacity and transit service has been capped since the initial opening of the HOV lane. Increased person movement cannot be expected from transit until late 2005 when the 99<sup>th</sup> Street park-and-ride facility opens. More information regarding transit use can be found in the Goal 4 discussion.
- € During the two-hour period, average vehicle occupancies on I-5 decreased compared to the October 2002 reporting period and increased compared to all other reporting periods.
- € During the peak hour, average vehicle occupancy increased compared to all prior reporting periods.

The table and figures above are summaries of vehicle occupancy counts, traffic counts, and bus ridership counts taken before and after the Vancouver HOV lane opened. The tables in Appendix A give baseline and “post-opening” total number of persons carried in the corridor and mode shares as well as comparing the average auto and vehicle occupancies to the baseline data. The tables in the Appendix provide more detailed summaries of the vehicle occupancies, mode shares, and vehicle and person trip usage in the I-5 corridor.



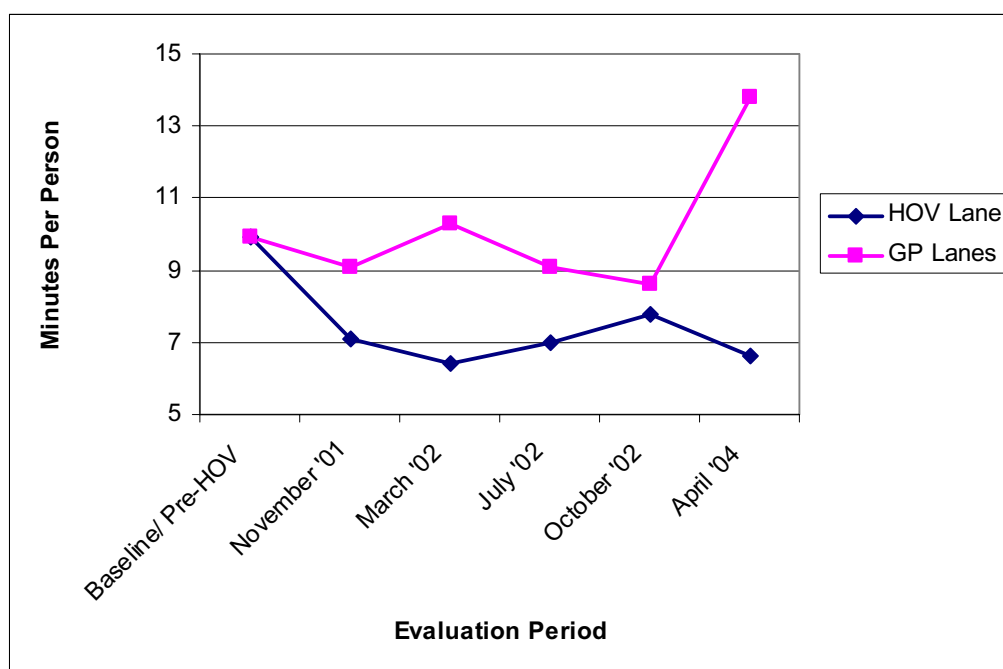
## Goal 2. Reduce peak period travel time for HOV lane users and reduce the average per-person travel time for all users.

Travel time will be measured by taking travel time runs in the field and making comparisons between the HOV and GP lanes.

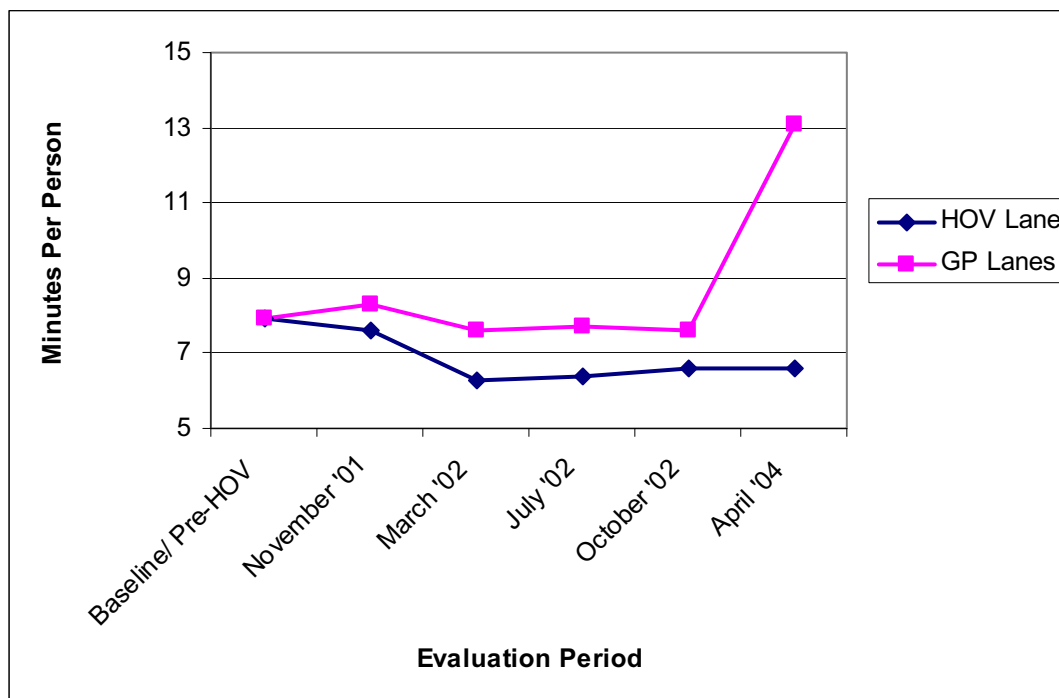
Travel times are summarized for single-occupancy vehicles and high occupancy vehicles in **Figures 6** and **7**. Expanded versions of Figures 5 and 6 containing data for all reporting periods are included in Appendix A. Since there was no HOV lane in the baseline condition, it is assumed that all of the vehicles on southbound I-5 had the same travel time.

Travel time by segment has been averaged over multiple observations made in each reporting period during the 6 to 8 AM period using the moving vehicle method described in the appendix of this report. The travel times were categorized for vehicles traveling on the corridor between the 99<sup>th</sup> Street interchange and the Interstate Bridge. Travel times were measured between off ramps. WSDOT provides an incident response vehicle that drives the general-purpose lanes and monitors the I-5 corridor during peak periods to respond to incidents or motorists' maintenance needs on the corridor. WSDOT has been collecting general purpose lane travel times on a regular basis since mid-December of 2001. The information from these travel runs was combined with the general purpose lane data collected by the consultant team. Combining these data sets provides an accurate picture of what is happening in the corridor on a daily basis. Note that HOV lane travel time computations are based on a limited number of observations and are subject to considerable variation. The listed travel times are approximate values, not absolute numbers.

**Figure 6. Two-Hour Travel Time Results for HOV and General Purpose Users  
99<sup>th</sup> Street to Interstate Bridge**



**Figure 7. Peak Hour Travel Time Results for HOV and General Purpose Users  
99<sup>th</sup> Street to Interstate Bridge**



### Findings To Date

- € On the measured days in April, the Vancouver HOV lane saved users over seven minutes over the entire two-hour period compared to GP users traveling the same distance.
- € Between October 2002 and April 2004, peak hour travel times increased significantly for GP users and remained stable for HOV users. The large increase in GP lane travel times correlates with significant increases in GP lane traffic volumes as detailed under Goal 1.
- € Travel time savings during the peak hour for HOV lane users increased compared to all prior reporting periods. The increase was caused by an increase in the GP travel times. HOV travel times remained stable.

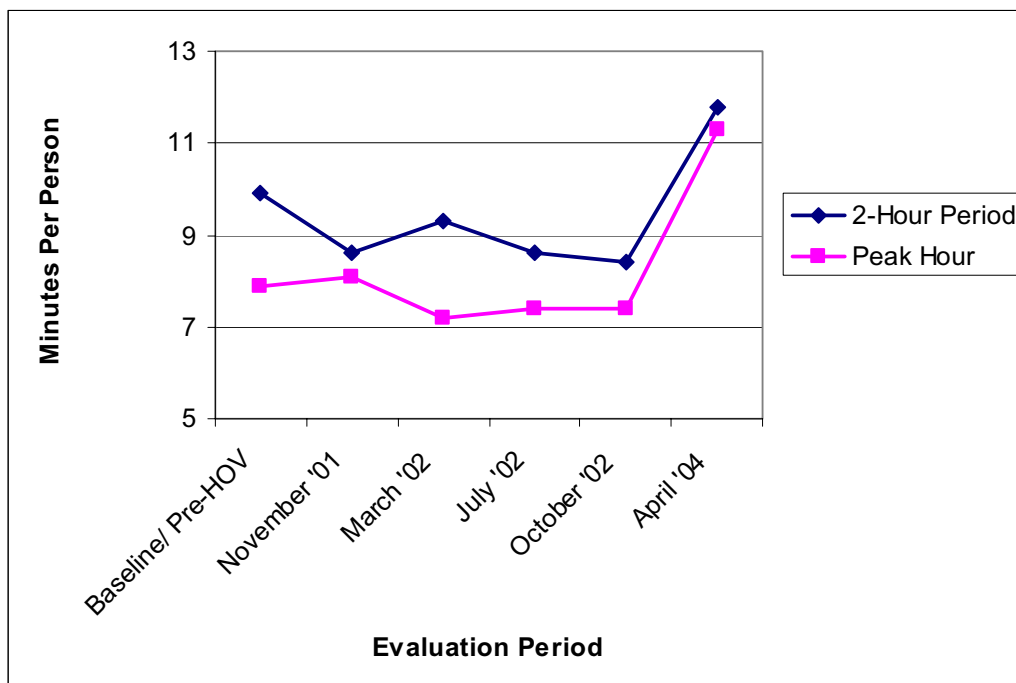
A more detailed travel time summary is included in Appendix A.

C-TRAN bus travel times in the corridor are discussed under Goal 7 (**Figure 16**).

The second half of Goal 2 is to reduce the average per person travel time for all users. Per person travel time is measured by summing the travel times for all persons in the HOV lane and the general-purpose lanes and dividing the total travel time by the total number of persons. **Figure 8** summarizes travel time per person for both the 2-hour period and the peak hour. Since

there was no HOV lane in the baseline condition, it is assumed that all of the vehicles on southbound I-5 had the same travel time. Appendix B contains a general summary of the methodology used to calculate average travel times.

**Figure 8. Travel Time Per Person, All Lanes  
99<sup>th</sup> Street to Interstate Bridge**



### Findings To Date

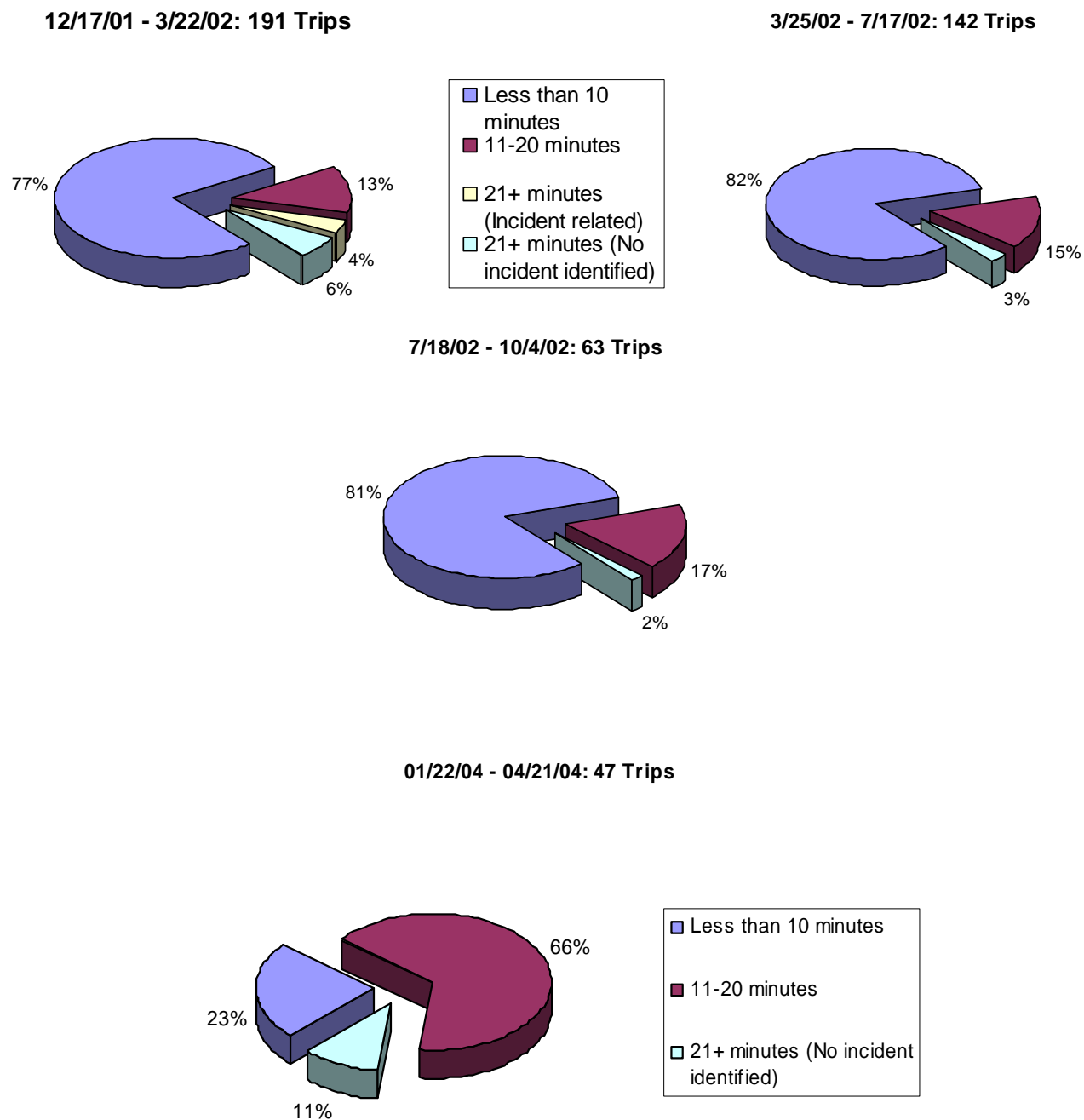
- During the 2-hour period and peak hour, travel time per person increased compared to all prior reporting periods. The increase was caused by an increase in the GP lane travel times. HOV travel times remained stable. The large increase in GP lane travel times correlates with significant increases in GP lane traffic volumes as detailed under Goal 1.

### WSDOT Incident Response Vehicle Travel Times

WSDOT provides an incident response vehicle that drives and monitors the I-5 corridor during peak periods to respond to incidents or motorists' maintenance needs on the corridor. WSDOT has been collecting travel times from those vehicle runs. The travel times are from the 99<sup>th</sup> Street Interchange to the Interstate Bridge. These runs are summarized in **Figure 9**. The figure summarizes incident vehicle trip times between 6:00 a.m. and 8:00 a.m. during which the WSDOT vehicle did not stop to assist a motorist. The charts summarize trips from the March, July, October, and April reporting periods. For trips in excess of 20 minutes, the figure denotes whether the delay was related to an incident. The average travel time for the 47 trips during the January to April 2004 reporting period was 13.8 minutes.

The data collected during WSDOT's travel time runs has been utilized on a daily basis to provide "real time" information to the traveling public. The travel time information is posted on WSDOT's Variable Message Sign (VMS) southbound on I-5 near the Clark County Fairgrounds.

**Figure 9. I-5 General Purpose Lane Travel Times  
99<sup>th</sup> Street to Interstate Bridge**

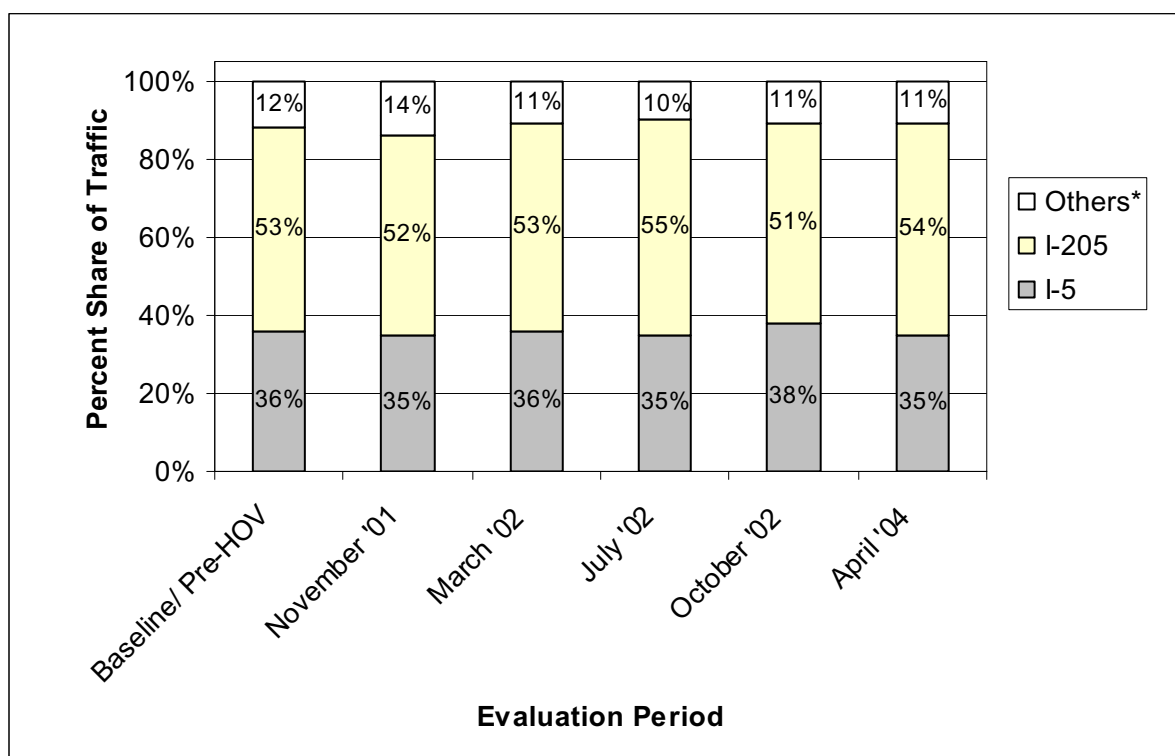


### Goal 3. Minimize impacts to other traffic in the corridor and on parallel facilities.

With increased delay in the general-purpose lanes, there is a potential that traffic could divert to parallel routes, such as I-205, Highway 99, Hazel Dell Avenue, and Lakeshore Drive. These counts were taken south of 99<sup>th</sup> Street. Additionally, before and after counts were taken for Main Street south of 39<sup>th</sup> Street to determine if traffic was diverting onto that facility to access the downtown area or west Vancouver.

The peak period share of traffic on each facility at 99<sup>th</sup> Street is summarized in **Figure 10**. It should be noted that I-5 traffic data at 99<sup>th</sup> Street was not available for this report due to the corridor construction activities. The I-5 data in Figure 10 is from the 33<sup>rd</sup> Street area. **Figure 11** summarizes the peak period share of traffic on I-5 and Main Street. It should be noted that the I-5 Main Street exit was closed during the Baseline data collection. The exit opened between the Baseline and November 2002 reporting periods. The increase in traffic on Main Street is likely attributable to the opening of the Main Street exit. Once opened, people working in downtown and western Vancouver could use the exit to access their work locations.

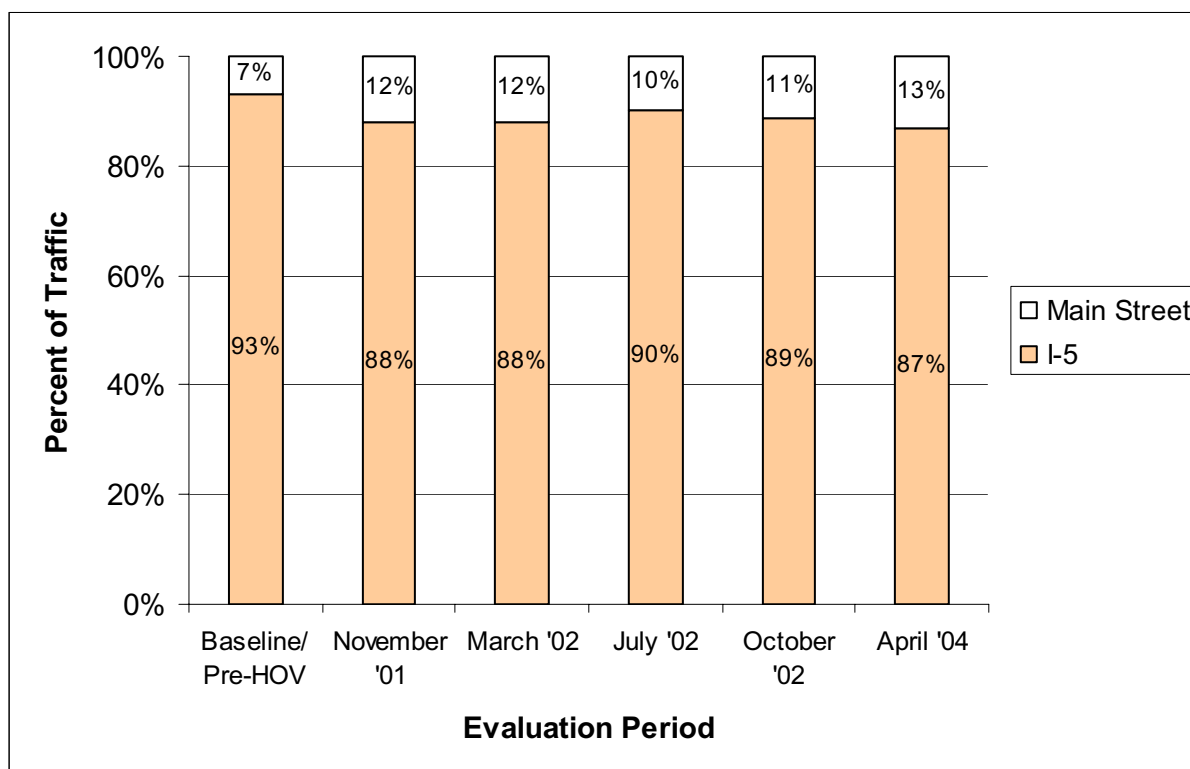
**Figure 10. Peak Period Facility Shares of Southbound Traffic**



\*Other facilities include Lakeshore Drive, Highway 99, and Hazel Dell Avenue.

### Findings To Date

- € The Vancouver HOV Lane has not caused a significant shift to I-205 or to parallel arterial routes.

**Figure 11. Peak Period Traffic Percentages Near 33<sup>rd</sup> Street**

### Findings To Date

- € The share of traffic on I-5 has decreased since the prior reporting period, but has remained comparatively stable over the 5 reporting periods.
- € The share of traffic on Main Street increased in April 2004 compared to the Baseline, but much of the increase is likely attributable to the completion of construction at the Main Street interchange.

### Other Traffic Impacts

I-5 traffic count data from the 5-6 a.m. and 8-9 a.m. period were analyzed to determine if traffic volumes were shifting to the hour before or after HOV lane operating hours. For the prior reporting periods, I-5 traffic volumes during the 5-9 a.m. period remained fairly constant. The variance among reporting periods was less than two percent. During the April 2004 reporting period, I-5 traffic volumes increased by over 1,000 vehicles, an increase of 11% since the October 2002 reporting period.

Traffic volumes during the 5-6 a.m. period have increased each reporting period compared to the Baseline. Volumes between 6 a.m. and 7 a.m. have remained relatively constant over each reporting period, with a decrease being measured during the April 2004 reporting period.

During prior reporting periods, the 7-8 a.m. period experienced decreased volumes. Volumes during the April 2004 reporting period increased significantly compared to the Baseline and to all prior reporting periods.

The 8-9 a.m. period experienced a small increase from the Baseline report to the November 2002 report. Volumes remained constant during the November, March, and July 2002 periods.

with increases in the October 2002 and April 2004 periods during the 8-9 a.m. period. Volumes reported in April 2004 have increased by approximately 25% compared to the Baseline reporting period.

The 5-6 a.m. and 8-9 a.m. periods both show increased volumes. Total traffic volumes have also increased during both the 5-9 a.m. period and the 6-8 a.m. reporting period. Detailed I-5 traffic counts are located in Table A-25 in Appendix A.

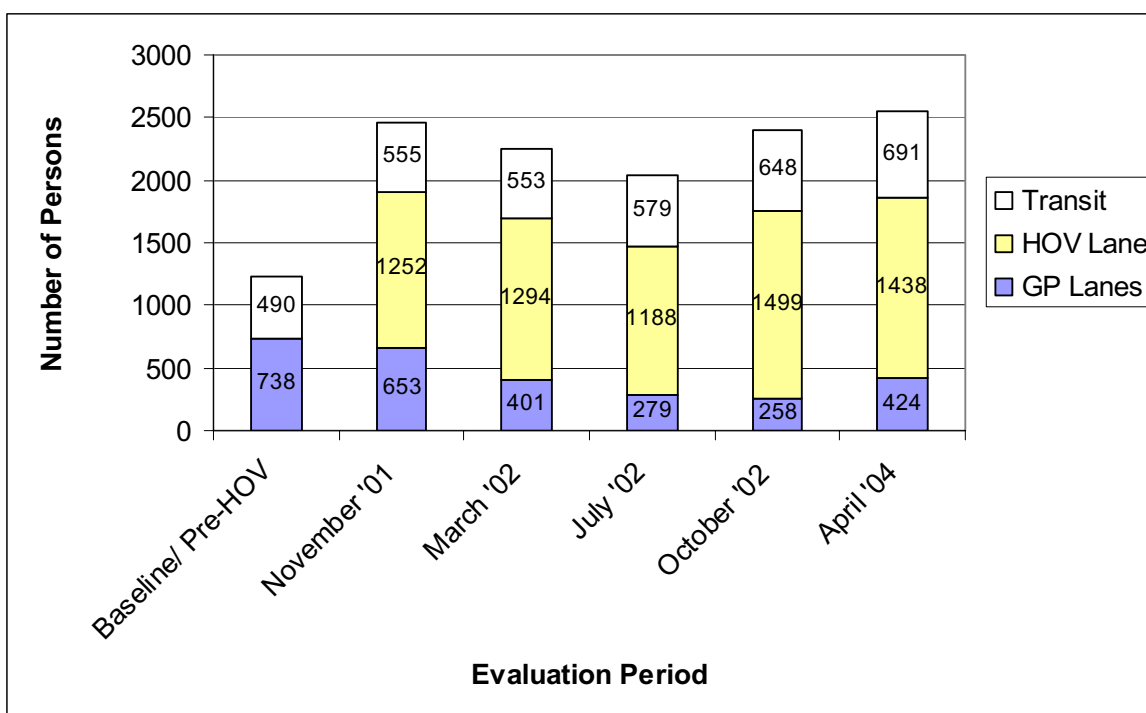
## Goal 4. Increase the use of carpools, vanpools, and transit.

This goal will be measured by vehicle counts and data from C-TRAN on ridership and Park-and-Ride utilization.

### Persons in Carpools, Vanpools, and Transit

**Figure 12** shows the persons in carpools, vanpools, and transit before and after HOV opening. A more detailed data table is included in Appendix A.

**Figure 12. Persons in Carpools, Vanpools, and Transit: 6-8 AM**



### Findings To Date

- € From October 2002 to April 2004, there was an increase in the number of persons using I-5 in carpools, vanpools, and transit. Excluding eligible HOVs that are using the general-purpose lanes, the Vancouver HOV lane has led to an increase of over 1,000 persons in carpools, vanpools, and transit compared to the baseline.
- € Transit ridership remained steady from October 2002 to April 2004
- € There was an increase in the number of HOVs using the general purpose lanes, apparently destined for downtown Vancouver or for SR-14.



## Park-and-Ride Usage

The Salmon Creek park-and-ride facility has been operating at capacity since the HOV lane opened. The ability of the HOV lane to carry more people is constrained by the number of park-and-ride spaces provided along the corridor. This artificial cap may not be remedied for another year until the 99th Street Park-and-Ride facility is open. Park-and-Ride usage is summarized in Table 2.

**Table 2. Park-and-Ride Usage**

Location	Baseline Daily Usage (Vehicles)	Daily Usage after HOV Opening (November 2001)	Daily Usage After HOV Opening (March 2002)	Daily Usage After HOV Opening (July 2002)	Daily Usage After HOV Opening (October 2002)	Daily Usage After HOV Opening (April 2004)
Salmon Creek Park-and-Ride <sup>1</sup>	439	438	428	436	436	436
Klineline Park	15	22	22	NA <sup>2</sup>	NA <sup>2</sup>	NA <sup>2</sup>

May 15-17, 2001 average (baseline).

November 2001, March 2002, July 2002, October 2002, and April 2004 (post-opening).

<sup>1</sup>The capacity of the Salmon Creek Park-and-Ride lot is 436 vehicles.

<sup>2</sup>Klineline Park is not used as a park-and-ride facility during the summer months. For the October 2002 and April 2004 reporting periods, it had not reopened for use as a park-and-ride facility.

C-TRAN will restripe the Salmon Creek park-and-ride facility in May 2004. The restriping will provide an additional 40 spaces.

## Vanpools and Employer Programs

C-TRAN offers a vanpool service program. C-TRAN subsidizes 25 percent of the lease cost for vanpools traveling to or from Clark County. C-TRAN also subsidizes the entire cost of fuel for vanpools traveling to or from Clark County and provides car wash coupons free of charge to vanpools participants. Nine (9) commuter vanpools carrying 94 vanpool riders currently operate. All 9 vanpools carry passengers from Washington to Oregon. Those vanpools travel to Farmers Insurance, Tektronix, Fred Meyers, and to various Swan Island businesses. Between October 2002 and April 2004, one vanpool was added. The new vanpool was formed to take advantage of the HOV lane.

The total number of vanpools has increased since the October 2002 reporting period. The number of vanpools currently operating is significantly less than past years, reflecting national trends. In February 2000, 15 vanpools were operating from Clark County to the Portland area. C-TRAN staff believes the decline in vanpools is attributable to the slowing economy and associated job decreases. Carpooling in the corridor is unaffected by this finding.

## Findings To Date

- € The Salmon Creek Park-and-Ride continues to operate at capacity, limiting growth in transit use of the HOV lane. The ability of the HOV lane to carry more people is constrained by the number of park-and-ride spaces provided along the corridor.
- € A park-and-ride facility is currently in development near the 99<sup>th</sup> Street interchange. This new facility is expected to be open in late 2005 and will provide additional park-and-ride capacity in the corridor.

- € The Kline Park parking facility is not available as a park-and-ride lot during the summer months and did not reopen for park-and-ride usage during the October 2002 and April 2004 reporting periods. During prior reporting periods, approximately 20 vehicles used the overflow park-and-ride facility.
- € The number of C-TRAN supported vanpools increased by one since the opening of the HOV lane.

### Goal 5. Maintain safety by not increasing the accident and incident rate in the corridor during HOV lane operating periods.

Safety is measured by examining reported accidents before and after HOV lane opening. There is typically a time lag between the time of the accident and when the accident is recorded to the state's accident database. Therefore, all reported accidents might not be included in this report.

A secondary measure is also used to evaluate corridor safety, which consists of using Washington State Police (WSP) and WSDOT incident management vehicle callout logs. As needed, the WSP dispatches incident response requests to WSDOT through their traffic management center. WSDOT staff is available to respond to provide assistance to disabled vehicles, crash scenes, and other incidents. The number of callouts is a measure of safety. **Table 3** details the number of Washington State Patrol (WSP) and WSDOT call-outs on the southbound side of I-5 between 134<sup>th</sup> Street and the Interstate Bridge. This correlates the number of callouts for incident management, accident scene traffic control, etc. with the safety information needed to evaluate the project.

On-roadway and off-roadway incidents are detailed in Table 3. Off-roadway incidents include collisions, vehicle breakdowns, abandoned vehicles, flat tires, running out of gas, etc. Off-roadway incidents may not affect safety other than motorists slowing to view the incident. As such, these incidents may not be relevant to the impact of the HOV lane on the safety of the corridor and occur regardless of the HOV lane. It should also be noted that WSDOT expanded its Incident Response Program in July 2002. The number of reported incidences increased significantly because WSDOT had more resources allocated to roving and patrolling the corridor.

A word of caution to the reader: accident statistics tend to lag behind the actual reporting dates and accidents often go unreported. Additionally, accident studies tend to look at multiple year periods of at least three years rather than short-term periods such as this. Caution is expressed about drawing long-term conclusions from short-term data.

**Table 3. Incident Management Call-Outs**

Evaluation Period	On-Roadway Incidents	Off-Roadway Incidents
Baseline/Pre-HOV	10	3
November 2001	12	0
March 2002	7	7
July 2002	5	17
October 2002	11	25
April 2004*	7	3

Data Collection Periods:

Baseline/September 2001 data (I-5 SB 6 to 9 AM)

October 29 - November 16, 2001 data (I-5 SB 6 to 9 AM)

March 11 – March 29, 2002 data (I-5 SB 6 to 9 AM)

July 1 – 19, 2002 data (I-5 SB 6 to 9 AM)

September 23 – October 11, 2002 data (I-5 SB 6-9 AM)

\*April 12 – April 30, 2004 data (I-5 SB 6-9 AM). WSP provided only partial call-out data for the April 2004 reporting period.

**Findings To Date**

- € Based on available data, operation of the Vancouver HOV lane appears to have had no impact on corridor safety or the number of on-roadway incidents. The number of on-roadway incidents decreased compared to the Baseline report and the October 2002 reporting period.
- € The number of off-roadway incidents appears to have decreased compared to the 3 prior reporting periods. WSP did not provide full data for the April 2004 reporting period. Definitive conclusions cannot be drawn based on the available data.

### Goal 6. Maintain the HOV lane's effectiveness with appropriate enforcement.

A measure of the HOV's effectiveness is to examine its violation rate. This is measured in two ways: the number of observed violators using the vehicle occupancy counts taken for the Vancouver HOV lane, and results of enforcement activities.

**Figure 13** shows the observed violation rates and the number of enforcement hours per day for the Vancouver HOV lane during the HOV operating periods for the November 2001, March 2002, July 2002, October 2002, and April 2004 reporting periods. The violation percentage represents those persons who were observed violating the HOV restriction. Note that motorcycles are eligible HOV lane vehicles regardless of the number of occupants. **Figure 14** shows the observed violation rates and the number of enforcement hours per day for the Vancouver HOV lane during the peak hour for the November 2001, March 2002, July 2002, October 2002, and April 2004 reporting periods.

**Figure 13. Observed Violation Data: 6-8 AM**

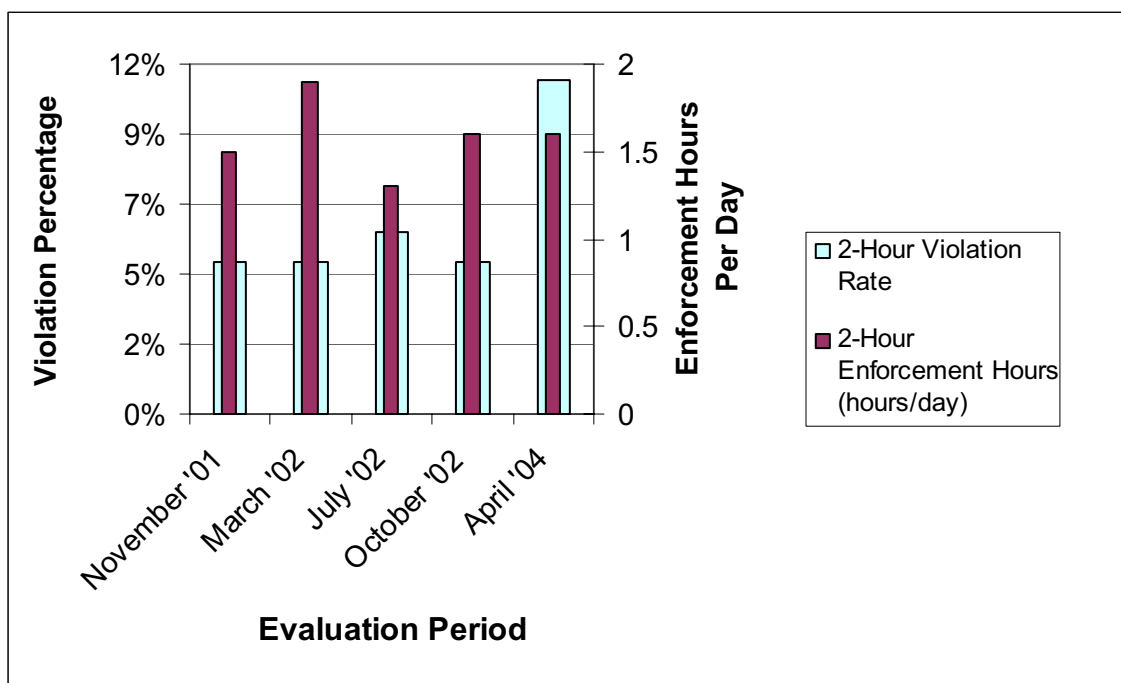
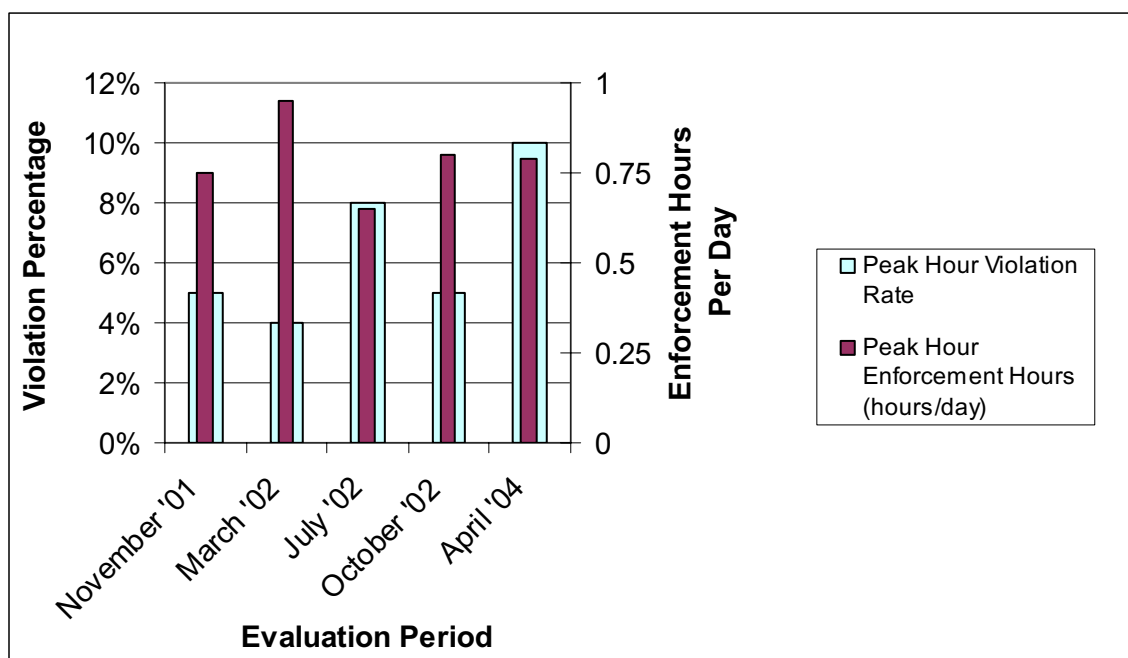


Figure 14. Observed Violation Data: Peak Hour



Detailed tables on the observed violation rates and enforcement hours are included in Appendix A.

### Findings to Date

- ⊘ The 2-hour period violation rate was 11 percent during the April 2004 reporting period, a violation rate much higher than prior reporting periods.
- ⊘ The peak hour violation rate was 10 percent during the April 2004 reporting period, a violation rate much higher than prior reporting periods.

The national violation rate average is in the 10-15% range. The Portland HOV lane has a violation rate of 10%, which is also within the national guidelines. The Vancouver lane has a violation rate of 11%, which is well within acceptable guidelines.

WSP reduced lane enforcement after the October 2002 reporting period and has only sporadically provided an enforcement presence. In other regions, a correlation exists between the level of enforcement and the violation rate. The lack of regular enforcement is likely contributing to the increased violation rate.

### Enforcement

Another measure of the performance of the Vancouver HOV lane is to track the number of HOV citations and warnings issued over time. For baseline conditions, the HOV lane was not operational; therefore, there were no HOV lane violations. The number of HOV lane violations and enforcement hours after HOV lane opening are reported in **Figures 15 and 16**.

Figure 15. Weekly Citations &amp; Enforcement Data

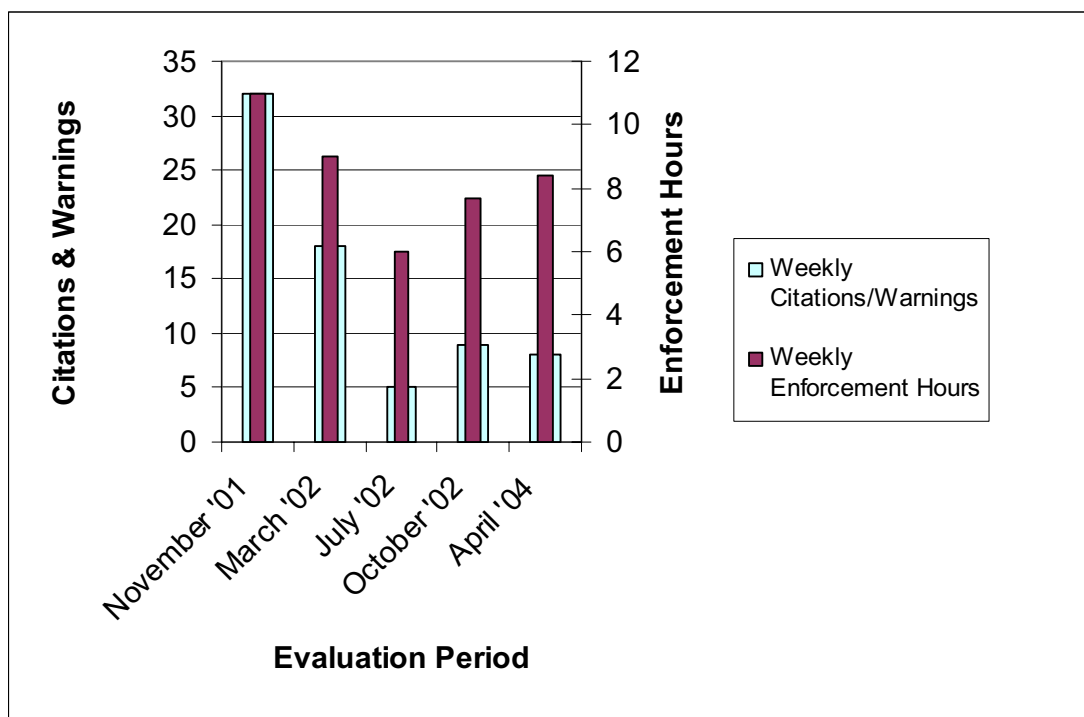
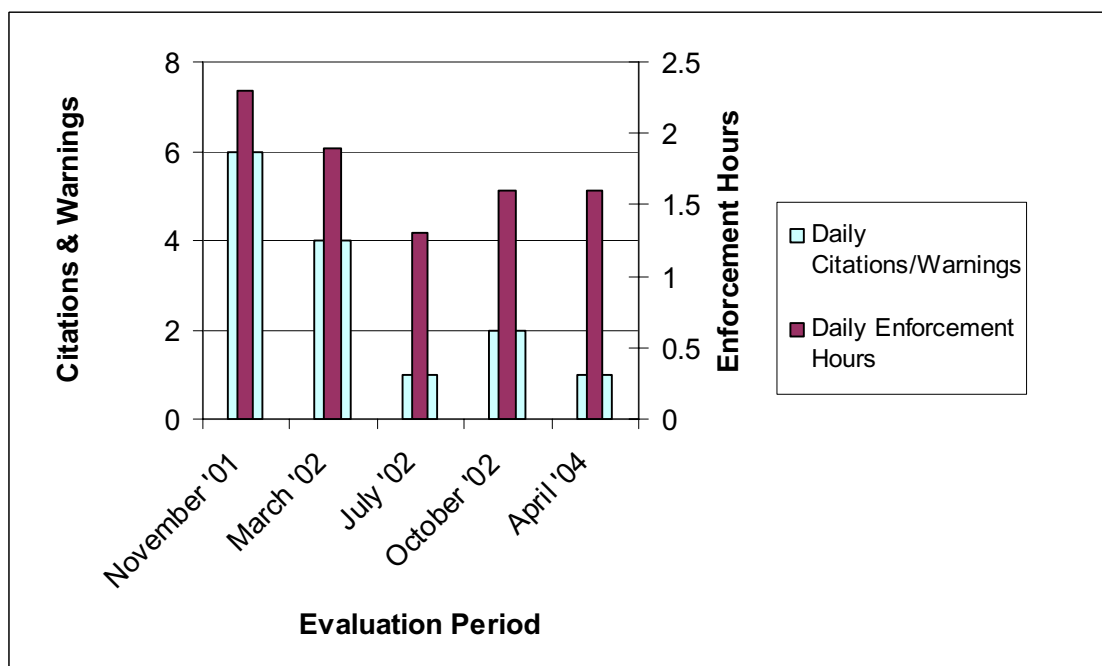


Figure 16. Daily Citations &amp; Enforcement Data



**Findings to Date**

- € The weekly and daily average number of citations and warnings issued decreased from October 2002 to April 2004. While the number of enforcement hours has fluctuated, the number of citations issued has decreased.
- € Since October 2002, WSP enforcement of the HOV lane has been sporadic. In other regions, a correlation exists between the level of enforcement and the violation rate. This irregular pattern of enforcement is likely contributing to the rise in the observed violation rate. Increased enforcement may reduce the violation rate to levels observed in the 2001 and 2002 evaluation rates.



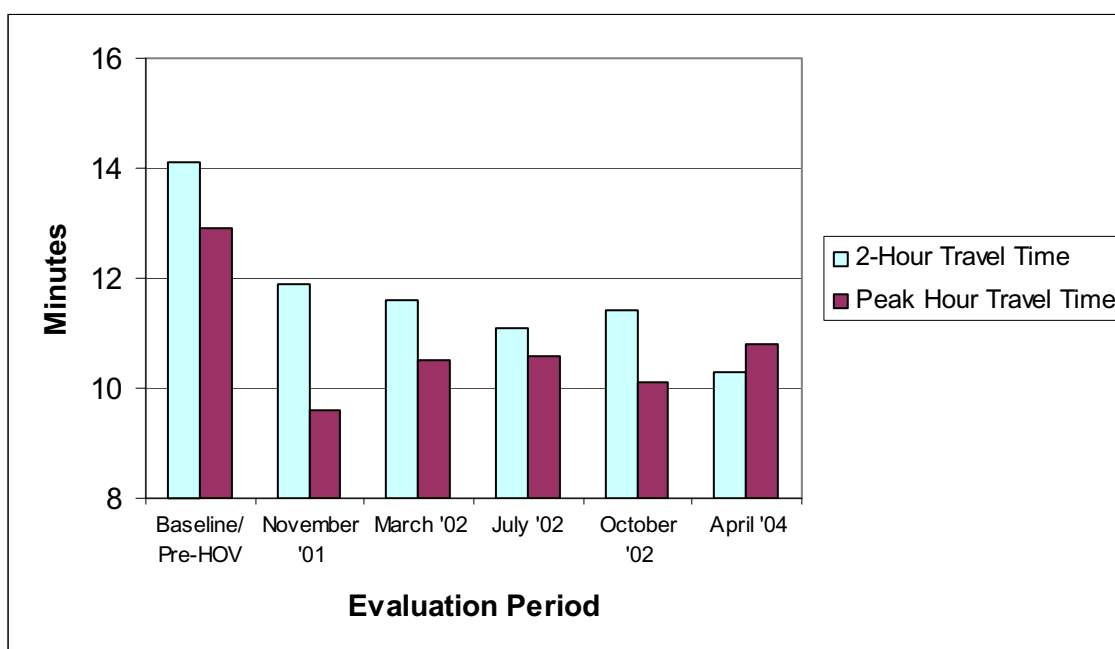
## Goal 7. Maintain or improve travel time reliability for carpools, vanpools, and transit.

HOV travel time reliability is measured by determining if the Vancouver HOV lane is maintaining an average speed of 45 mph or higher over the length of the lane and evaluating on-time bus performance statistics.

### C-TRAN Bus Travel Times

Bus on-time performance statistics include measuring the travel time from the Salmon Creek Park-and-Ride to the Interstate Bridge. **Figure 17** provides a detailed summary of the travel times for C-TRAN Route 34 from the Salmon Creek Park-and-Ride facility to the Interstate Bridge.

**Figure 17. C-TRAN Travel Time Results:  
Salmon Creek Park and Ride to Interstate Bridge**



### Findings to Date

- ⊘ Travel times during the two-hour period for C-TRAN Route 134 have decreased compared to all prior reporting periods.
- ⊘ Travel times during the peak hour for C-TRAN Route 134 have increased compared to all prior reporting periods except the Baseline reporting period.
- ⊘ Travel times during the two-hour period and peak period for Route 134 have decreased since the Baseline Period and remained relatively stable since the opening of the HOV lane.

## HOV Lane Average Travel Speeds

Table 4 details average travel speeds for the HOV lane.

**Table 4. HOV Average Travel Speeds  
Over Two-Hour Period and Peak Hour**

Time	November '01 Average Speed (MPH)	March '02 Average Speed (MPH)	July '02 Average Speed (MPH)	October '02 Average Speed (MPH)	April '04 Average Speed (MPH)
<b>Two-hour period 6-8 AM</b>					
99 <sup>th</sup> Street to SR-500	62	62	63	60	63
SR-500 to Mill Plain	55	56	57	53	56
<i>Average over Length of HOV Lane</i>	<i>60</i>	<i>60</i>	<i>62</i>	<i>58</i>	<i>61</i>
<b>Peak hour</b>					
99 <sup>th</sup> Street to SR-500	62	63	64	62	63
SR-500 to Mill Plain	55	46	59	56	56
<i>Average over Length of HOV Lane</i>	<i>60</i>	<i>58</i>	<i>63</i>	<i>61</i>	<i>61</i>

Measured from 99<sup>th</sup> Street to Mill Plain Boulevard.

Travel Time Runs from November-December 2001, March 2002, July 2002, October 2002, and April 2004.

## Findings To Date

- € The Vancouver HOV lane is maintaining at least 45 mph along its entire length both during the peak hour and overall during the two-hour period.

**Goal 8. Maintain or improve public opinion as to the effectiveness of HOV lanes.**

Three public opinion evaluation reports have been generated through the life of the evaluation period. Summaries of these reports are located in the prior evaluation reports. However, no opinion surveys have been conducted for the current reporting period. Therefore, no new assessment of this goal can be ascertained.

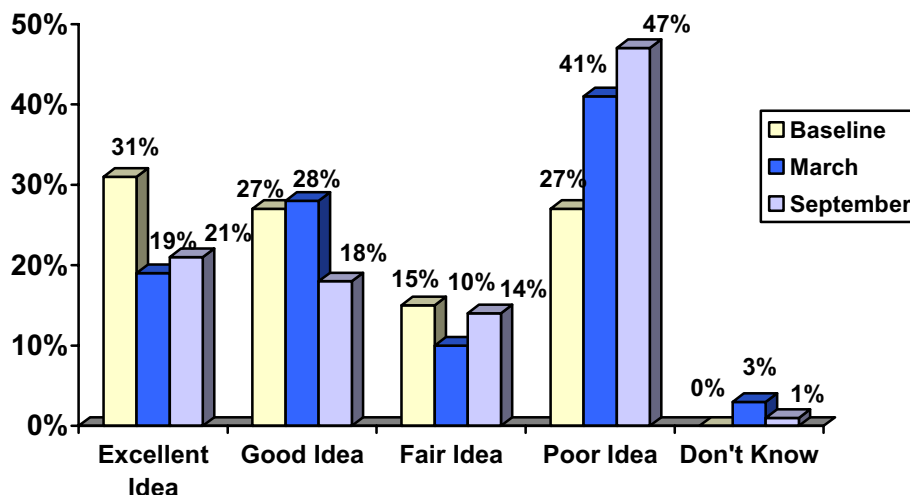
**Prior Survey Summary Data**

The first survey was conducted prior to the opening of the HOV lane in September 2001. That Baseline serves as a benchmark from which to measure additional research. The second public opinion survey was conducted in March 2002, five months after the HOV trial lane project's inception to capture initial reactions of Vancouver area residents. The quantitative analysis targeted individuals who use the I-5 southbound lanes at least three times per week, during the morning peak period of 6:00 a.m. to 8:00 a.m., the HOV lane operating hours. The purpose of this research was to measure public perceptions of the currently operating HOV lane, particularly as it applies to benefits and challenges experienced by commuters since the lane inception. Respondents also shared their views on whether the lane should be permanently adopted and comments were gathered from those who were supportive of the lane, as well as those in opposition. Information regarding trip purpose and various modes of transportation used were also collected. The results of that study were reported and a comparison was provided to the Baseline study conducted prior to October of 2001. A summary of the September 2001 and March 2002 surveys can be found in Evaluation Reports #1 and #2, respectively.

A second follow-up research study was conducted one year after the Vancouver HOV Lane pilot project began (the September 2002 Survey). This quantitative study again targeted individuals who use the I-5 southbound lanes at least three times per week, during the morning peak period of 6:00 a.m. to 8:00 a.m. The questionnaire used was nearly identical to that used for the March 2002 survey.

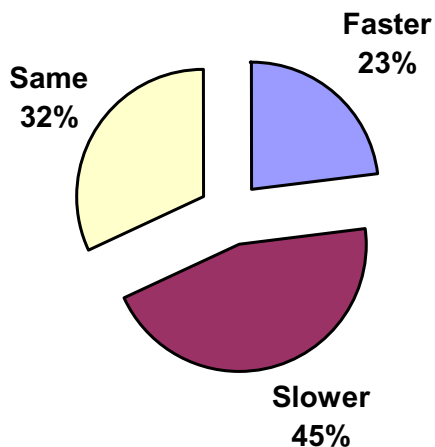
- € In September 2002, overall, consumer opinion on lane approval decreased since the Baseline Study. In September 2002, thirty-nine percent (39%) of the respondents surveyed agreed that the Vancouver HOV Lane was an excellent or good idea as compared to 47% of respondents completing the March 2002 Study and 58% in the Baseline Study. This was a 19% decrease in those who believe the lane is an excellent or good idea from the Baseline study. At the same time, the number of respondents asserting that the HOV lane was a poor idea increased 20% from 27% in the Baseline to 47% in September 2002.

## Q12. Do you think the Vancouver HOV Lane is an...



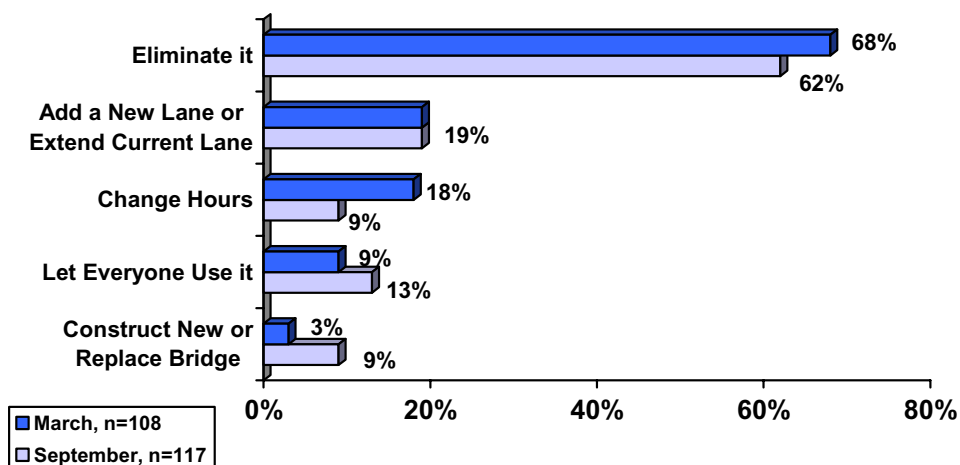
- € In September 2002, sixty-five percent (65%) of the respondents indicated they typically drove alone and 58% agreed that the Vancouver HOV lane was a poor idea. This dislike for the HOV lane was up 8% since March 2002 and 22% from the Baseline Study. During the Baseline Study, only 36% of the single drivers felt the lane was a poor idea.
- € In September 2002, thirty percent (30%) of respondents indicated that their driving habits had changed since the inception of the HOV lane, up 3% from the March 2002 results. Of these 59 respondents, 41% departed earlier or later, up from 17% in March 2002. Eighteen percent (18%) of respondents cited they had changed their route or travel pattern. This is down from 33% of travelers who indicated a change of route or travel pattern in March 2002. An additional 18% now carpool and 4% take the bus. Of the 18% who declared they carpooled, 38% of them stated that they carpooled more than two days a week earlier in the survey as opposed to 30% carpools two days or more from March 2002.
- € In September 2002, forty-five percent (45%) of respondents testified to a slower commute compared to six months ago, which was up 5% from the March 2002 Study. At the same time, 23% indicated their commutes were faster and 32% believed the commute to be the same length.

**Q15. How is your commute now compared to six months ago?**



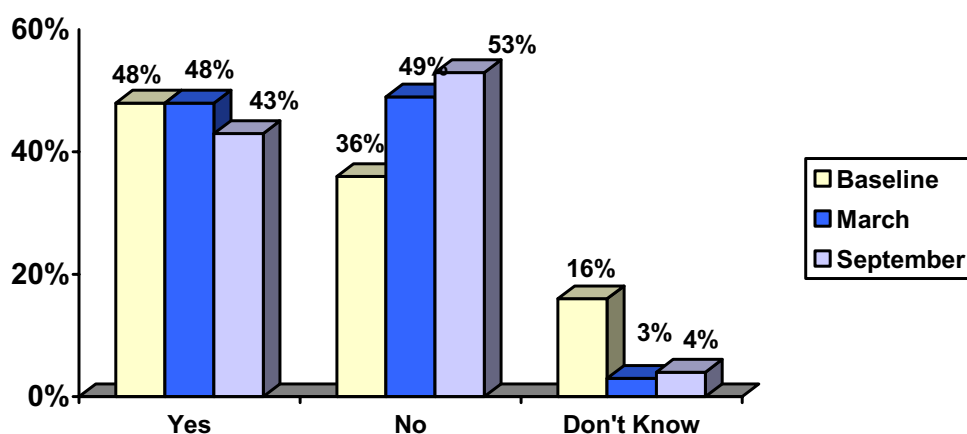
€ In September 2002, fifty-nine percent (59%) of the respondents interviewed felt that changes were needed to the HOV lane, while 40% did not believe any changes needed to be made at all. The change most commonly recommended was to “eliminate the HOV lane entirely,” stated by 62% of the 117 respondents citing change is needed. This was down slightly from those 68% in March 2002 that felt the lane should be eliminated. As in March 2002, “add a new lane or extend the current one” represented 19% of the opinions regarding a change. Additionally, “let everyone use it or make it public” was mentioned by 13% of individuals, up from 9% in March. By combining this 13% with those stating “eliminate it” (62%), a full 75% of those looking for change were entirely against the lane. Overall, this represented 44% of the 200 respondents surveyed, up from 41% in March 2002. Nine percent (9%) requested a “change in hours or time of use,” down from 18% in March. An additional 9% suggested “construct a new bridge, replace the bridge or add a lane to the bridge.” While some acknowledged the difficulty of this task, it seems to be their chosen solution to the traffic issues.

**Q21. What would your changes be?**



- € Respondents participating in the September 2002 survey have tipped the scale regarding whether or not to make the Vancouver HOV Lane a permanent fixture on I-5 Southbound. In September 2002, fifty-three percent (53%) agreed that the lane should not be permanently adopted, up from 49% in March 2002 and from 36% in the Baseline Study. The percentage of respondents in support of the Vancouver HOV Lane adoption differed by 5% compared to the March 2002 and Baseline results of 48%. Initially, Baseline survey results indicated that 16% of respondents were unsure if the HOV lane should be permanently adopted. This amount of uncertainty was reduced to just 3% in March 2002 and increased by 1% in the September 2002 survey to 4%. These findings are summarized in the chart below.

**Q22. Do you think the Vancouver HOV Lane should be permanently adopted?**



- € The reasons most often cited for support of permanent Vancouver HOV Lane adoption were:

Encourages carpooling/benefits carpoolers	37%
Get there faster/save time	26%
Traffic moves better/faster	11%
Works well, good idea	14%

- € The reasons most often cited for opposition of permanent Vancouver HOV Lane adoption were:

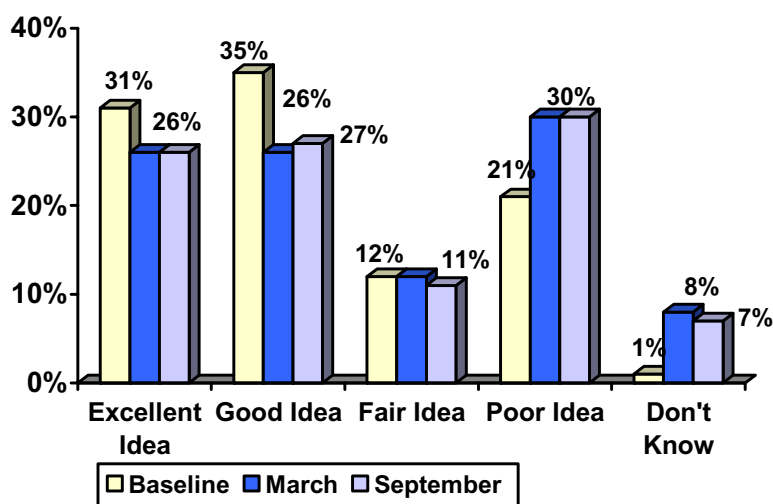
Not used enough/wastes capacity of lane	38%
Slows down traffic/causes longer commute	29%
HOV is not effective or it does not work	15%
Want more lanes, there aren't enough lanes	9%

- € In September 2002, fifty-three percent (53%) of respondents surveyed believed the Portland HOV lane was an excellent or good idea compared to 52% in March and 66% of the respondents in the Baseline Survey. Forty-one percent (41%) of the respondents interviewed thought the Portland HOV lane was a poor or fair idea; nearly identical to the 42% reported in March 2002, yet up from Baseline results of 32%. The numbers of respondents who are uncertain about the Portland HOV lane increased from less than

1% in the Baseline Survey to approximately 8% in the March 2002 Survey and remained stable with 7% in September 2002.

- Respondents who believe the Vancouver HOV lane is an excellent or good idea overwhelmingly agree that the Portland HOV lane is an excellent or good idea. In September 2002, fifty-seven percent (57%) of those believing the Vancouver lane is an excellent or good idea agreed the Portland HOV lane was an excellent idea while 29% believed it was a good idea. Conversely, 60% of respondents stating the Vancouver HOV lane was a poor idea also believed the Portland HOV lane was a poor idea.

#### Q25. Is the ODOT HOV lane on I-5 northbound an...



€ Respondents were asked to rate seven possible incentives that may or may not encourage commuters to carpool or take the bus. Respondents used a 1-5 scale, with one (1) being Not Attractive and five (5) being Extremely Attractive. Three (3) was the Neutral point. These scores were combined to obtain an average for each of the seven incentives. The average scores fell between 2.32 and 2.86, which indicates that respondents felt that all incentives were somewhere between being Neutral to Not Very Attractive.

- This series of questions was asked in the Baseline, March 2002, and September 2002 Surveys, however a slight wording change was made to the March 2002 and September 2002 Surveys. For clarification purposes, the March 2002 and September 2002 survey questions put more emphasis on obtaining the respondents feelings rather than attaining a general opinion of the various incentives. The new wording included “how well does this encourage you to carpool or take the bus.”
- A noticeable difference was observed in March 2002 when this slight wording change was made, as the results decreased in median scores for each incentive. The results from the September 2002 survey also vary from the Baseline study, yet are inline with those obtained in March 2002. Looking at the incentives only based on the Extremely Attractive and Somewhat Attractive ratings combined, respondents cited the following:

Incentive Rated	Baseline Results	March 2002 Results	September 2002 Results
More convenient Park & Ride locations	3.62	2.76	2.86
Free bus tickets for a trial period	3.77	2.71	2.64
Discounted downtown parking	3.61	2.68	2.65
More parking spaces at an existing Park & Ride lot	3.45	2.66	2.70
Discounted bus tickets	3.52	2.53	2.52
Special close-in parking at work for carpools	3.31	2.27	2.65
Assistance in finding a compatible carpool partner	2.91	2.19	2.32

The following commuter statistics were drawn from the survey:

- € In September 2002, the majority of respondents, 51%, entered I-5 southbound at or **South** of the 99<sup>th</sup> Street interchange, while 37% entered the same stretch of road from the **North** and 12% stated their entrance pattern varies daily. The September 2002 data were 6% higher than March's 45% for travelers entering the freeway **South** of the 99<sup>th</sup> Street interchange, however this was still lower than the Baseline results of 57%.
- € In September 2002, half of the respondents interviewed, 51%, exited I-5 southbound **South** of Mill Plain Boulevard and 25% of respondents exited before or at Mill Plain Boulevard. Twenty-five percent (25%) suggested their exit patterns vary by their daily commute, which is down from the March 2002 results of 30%.
- € In September 2002, seventy-six percent (76%) of respondents traveled on I-5 southbound in the area of the Vancouver HOV trial lane for work. This was 8% fewer than those who traveled for work in March 2002 (84%), though only 2% less than discovered in the Baseline of 78%. While slightly fewer respondents are commuting for work purposes, it seems that more people are traveling to visit family and friends. Fifteen percent (15%) of respondents testified to traveling for this purpose while previously there were no significant data reported in this category.
- € In September 2002, ninety-five percent (95%) of the respondents interviewed primarily drove or carpooled to their destinations most often as compared to 96% from the Baseline and 93% in the March 2002 Study. Overall, 6% of respondents utilized mass transportation, up from the Baseline results of 4% and just under the 7% found in March 2002. Of the population surveyed, 5% used C-TRAN from a Park & Ride and 1% rode C-TRAN by other means.
- € Among respondents who carpooled at least two days a week, 55% traveled for work reasons compared to 64% in March 2002 and 58% in the Baseline. As fewer carpools were actually commuting for work related purposes, more were carpooling to visit family and friends, 21%, or for doctor or medical reasons, also 21%. Both these numbers were up at least 15% from previous studies.



- € In September 2002, the average length of time a traveler reported he/she spent commuting to work, school, shopping, or other activities, one-way, was 26.92 minutes. This was roughly 2 minutes shorter than the time reported in March 2002 and 1-½ minutes longer than found in the Baseline Study. The longest commute was for respondents coming from Battle Ground at 35.50 minutes; down 3-½ minutes from March's 39-minute commute time and only about 2 minutes higher than Baseline results. North Clark County had the second lengthiest commute of 27.14 minutes also down nearly 3 minutes from the March 2002 Study. Interestingly, North Clark County is the only community that testified to having a shorter commute in September 2002 compared to March 2002 or the Baseline studies noted at 30 minutes and 29.8 minutes respectively
- € In September 2002, sixty-five percent (65%) of the Washington respondents surveyed typically drove alone, down 3% from the March 2002 study results of 68% yet slightly higher than the 61% of drivers who traveled alone during the Baseline. Twelve percent (12%) of respondents usually drove or rode with someone else. The percentage of surveyed commuters driving or riding with someone else fell 15% from the first study, from 25% to 10% in March 2002.
- € There was a steady rise in the percentage of respondents who did some carpooling and driving alone, from 10% in the Baseline to 17% in the March 2002 survey to 20% in September 2002. The difference of 10% in the Baseline to 20% in September 2002 is a significant difference.

### **Comments Received from Emails, Letters, and Phone Calls**

Agencies within Clark County have received phone calls, letters, and e-mails regarding the Vancouver HOV lane. Most were sent to WSDOT with some directed to RTC and others to C-TRAN. Comments generally were received from those stating they regularly commute on I-5, while other comments were received from elected officials and others with interest in the project. Some of the early comments were received through the "Hot Issues" section of the web site of the local newspaper, The Columbian.

WSDOT is recording these comments for consideration during the HOV evaluation process. WSDOT received less than 15 comments during the past 18 months (January 2003 to June 2004). The comments were received via e-mail and phone calls. All comments received were negative. Comments received were generally from GP lane users concerned about the perceived lack of HOV lane usage and the HOV lane violation rate.

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**Goal 1 Tables**

**Table A-1** shows the total number of person trips (sum of persons per lane) based on counts taken in May 2001 (vehicle occupancies) and September 2001 (counts) for the Baseline Report. Post opening vehicle occupancy and vehicle counts are listed for November 2001, March 2002, July 2002, October 2002, and April 2004.

**Table A-1. Total Person Trips Using the I-5 Corridor<sup>1</sup>**

Measure	Baseline (September 2001)		After HOV Opening (November 2001)		After HOV Opening (March 2002)		After HOV Opening (July 2002)		After HOV Opening (October 2002)		After HOV Opening (April 2004)	
	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons
Two-hour count (6-8 AM)	6,153	7,010	5,779	7,220	6,100	7,521	5,811	7,177	5,548	7,098	6,343	7,988
Change from baseline	---	---	-374	+210	-53	+511	-342	+167	-605	+88	+190	+978
Percent change from baseline	---	---	-6%	+3%	-1%	+7%	-6%	+2%	-10%	+1%	+3%	+14%
Change from November 2001	---	---	---	---	+321	+301	+32	-43	-231	-122	+564	+768
Percent change from November 2001	---	---	---	---	+6%	+4%	+1%	-1%	-4%	-2%	+10%	+11%
Change from March 2002	---	---	---	---	---	---	-289	-344	-552	-423	+243	+467
Percent change from March 2002	---	---	---	---	---	---	-5%	-5%	-9%	-6%	+4%	+6%
Change from July 2002	---	---	---	---	---	---	---	---	-263	-79	+532	+811
Percent change from July 2002	---	---	---	---	---	---	---	---	-5%	-1%	+9%	+11%
Change from October 2002	---	---	---	---	---	---	---	---	---	---	+795	+890
Percent Change from October 2002	---	---	---	---	---	---	---	---	---	---	+14%	+13%

Measure	Baseline (September 2001)		After HOV Opening (November 2001)		After HOV Opening (March 2002)		After HOV Opening (July 2002)		After HOV Opening (October 2002)		After HOV Opening (April 2004)	
	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons
Peak hour count (6:15-7:15 AM) <sup>2</sup>	3,166	3,660	2,984	3,767	3,223	3,981	3,038	3,638	3,172	3,825	3,468	4,411
Change from baseline	---	---	-182	+107	+107	+321	-128	-22	+6	+165	+302	+751
Percent change from baseline	---	---	-6%	+3%	+3%	+9%	-4%	-1%	<1%	5%	+10%	+21%
Change from November 2001	---	---	---	---	+239	+214	+54	-129	+188	+58	+484	+644
Percent change from November 2001	---	---	---	---	+8%	+6%	+2%	-3%	+6%	+2%	+16%	+17%
Change from March 2002	---	---	---	---	---	---	-185	-343	-51	-156	+245	+430
Percent change from March 2002	---	---	---	---	---	---	-6%	-9%	-2%	-4%	+8%	+11%
Change from July 2002	---	---	---	---	---	---	---	---	+134	+187	+430	+773
Percent change from July 2002	---	---	---	---	---	---	---	---	+4%	+5%	+14%	+21%
Change from October 2002	---	---	---	---	---	---	---	---	---	---	+296	+586
Percent change from October 2002	---	---	---	---	---	---	---	---	---	---	+9%	+15%

<sup>1</sup>Measured near 33<sup>rd</sup> Street for the three through traffic lanes.

<sup>2</sup>Peak hour was 6:15-7:15 AM for the Baseline, November 2001, and March 2002 reports. The peak hour shifted to 6:00-7:00 AM during the July 2002 and October 2002 reporting periods. The peak hour shifted to 7:00-8:00 AM during the April 2004 reporting period.

**Tables A-2** through **A-23** give baseline and “post-opening” total number of persons carried in the corridor and mode shares as well as comparing the average auto and vehicle occupancies to the baseline data. These tables provide detailed summaries of the vehicle occupancies, mode shares, and vehicle and person trip usage in the I-5 corridor. The data from these tables were used to develop the tables and graphics for Goal 1 in the main document.

**Tables A-2** and **A-13**, respectively, summarize the baseline two-hour and peak hour person-trip mode shares for all three through traffic lanes while **Tables A-3, A-4, A-5, A-6, A-7, A-13, A-14, A-15, A-16, A-17, and A-18** summarize the two-hour and peak hour person-trip mode shares for the November 2001, March 2002, July 2002, October 2002, and April 2004 post-opening reporting periods. **Tables A-8, A-9, A-10, A-11, and A-12** are for the HOV and GP lanes for the two-hour period, while **Tables A-19, A-20, A-21, A-22, and A-23** are peak hour tables summarizing the HOV and two through general purpose traffic lanes.

**Table A-2. Baseline Two-Hour Persons by Mode  
for all Lanes on Southbound I-5**

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	5,288	5,288	76%
Carpool: 2-person	316	632	9%
Carpool: 3+ person	31	93	>1%
Trucks	498	498	7%
Motorcycles	0	0	0%
Buses	20	499	7%
TOTAL	6,153	7,010	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Occupancy counts (each mode's share of total traffic) taken May 16 and 17, 2001.

Traffic counts taken in September 2001.

Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $7,010/6,153 = 1.14$   
 Average auto occupancy = total number of non-transit persons/total number of non-transit vehicles  
 Average auto occupancy =  $6,511/6,133 = 1.06$

**Table A-3. November 2001 Post Opening Two-Hour Persons  
by Mode for all Lanes on Southbound I-5**

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	4,570	4,570	63%
Carpool: 2-person	780	1,560	22%
Carpool: 3+ person	23	69	1%
Vanpools	8	88	1%
Trucks	378	378	5%
Motorcycles	0	0	0%
Buses	20	555	8%
TOTAL	5,779	7,220	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken in Nov. 2001.  
Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $7,220/5,779 = 1.25$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $6,665/5,759 = 1.16$

**Table A-4. March 2002 Post Opening Two-Hour Persons  
by Mode for all Lanes on Southbound I-5**

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	4,999	4,999	66%
Carpool: 2-person	790	1,580	21%
Carpool: 3+ person	9	27	<1%
Vanpools	8	88	1%
Trucks	264	264	4%
Motorcycles	10	10	<1%
Buses	20	553	7%
TOTAL	6,100	7,521	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken in March 2002.  
Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $7,521/6,100 = 1.23$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $6,968/6,080 = 1.15$

**Table A-5. July 2002 Post Opening Two-Hour Persons  
by Mode for all Lanes on Southbound I-5**

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	4,667	4,667	65%
Carpool: 2-person	661	1,322	18%
Carpool: 3+ person	19	57	1%
Vanpools	8	88	1%
Trucks	386	386	5%
Motorcycles	49	49	<1%
Buses	21	608	8%
TOTAL	5,811	7,177	100.00%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Occupancy counts (each mode's share of total traffic) and traffic counts taken in July 2002.

Bus data obtained from C-TRAN.

One bus was viewed in the GP lanes. Assumed to be tourist bus. Occupancy assumed to be same as that for C-TRAN buses.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $7,177/5,811 = 1.24$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $5,790/6,569 = 1.13$



**Table A-6. October 2002 Post Opening Two-Hour Persons  
by Mode for all Lanes on Southbound I-5**

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	4,421	4,421	62%
Carpool: 2-person	812	1,624	23%
Carpool: 3+ person	15	45	1%
Vanpools	8	88	1%
Trucks	248	248	4%
Motorcycles	24	24	<1%
Buses	20	648	9%
TOTAL	5,548	7,098	100.00%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken Oct. 1 & 2, 2002.  
Bus data obtained from C-TRAN.

One bus was viewed in the GP lanes. Assumed to be tourist bus. Occupancy  
assumed to be same as that for C-TRAN buses.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $7,098/5,548 = 1.28$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $6,450/5,528 = 1.17$

**Table A-7. April 2004 Post Opening Two-Hour Persons by Mode for all Lanes on Southbound I-5**

Measured Near 33<sup>rd</sup> Street

Mode	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	5,108	5,108	64%
Carpool: 2-person	869	1,738	22%
Carpool: 3+ person	10	30	<1%
Vanpools	9	94	1%
Trucks	327	327	4%
Motorcycles	0	0	0%
Buses	20	691	9%
<b>TOTAL</b>	<b>6,343</b>	<b>7,988</b>	<b>100.00%</b>

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken April 20 & 21, 2004.

Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $7,988/6,343 = 1.26$   
 Average auto occupancy = total number of non-transit persons/total number of non-transit vehicles  
 Average auto occupancy =  $7,297/6,326 = 1.15$

**Table A-8. November 2001 Post Opening Two-Hour Persons by Mode for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	HOV Lane			GP Lanes		
	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	31	31	2%	4,539	4,539	85%
Carpool: 2-person	571	1,142	61%	209	418	8%
Carpool: 3+ person	23	69	4%	0	0	0%
Vanpools	8	88	5%	0	0	0%
Trucks	0	0	0%	378	318	7%
Motorcycles	0	0	0%	0	0	0%
Buses	20	555	30%	0	0	0%
<b>TOTAL</b>	<b>653</b>	<b>1,885</b>	<b>100%</b>	<b>5,126</b>	<b>5,335</b>	<b>100%</b>

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken November 13 and 14, 2001.

Bus data obtained from C-TRAN.

**Table A-9. March 2002 Post Opening Two-Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	HOV Lane			GP Lanes		
	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	31	31	2%	4,968	4,968	88%
Carpool: 2-person	612	1,224	65%	178	356	6%
Carpool: 3+ person	5	15	1%	4	12	<1%
Vanpools	5	55	3%	3	33	1%
Trucks	0	0	0%	264	264	5%
Motorcycles	10	10	<1%	0	0	0%
Buses	20	553	29%	0	0	0%
<b>TOTAL</b>	<b>683</b>	<b>1,888</b>	<b>100%</b>	<b>5,417</b>	<b>5,633</b>	<b>100%</b>

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken March 20 and 21, 2002.

Bus data obtained from C-TRAN.

**Table A-10. July 2002 Post Opening Two-Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	HOV Lane			GP Lanes		
	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	38	38	2%	4,629	4,629	87%
Carpool: 2-person	529	1058	57%	132	264	5%
Carpool: 3+ person	14	42	2%	5	15	<1%
Vanpools	8	88	5%	0	0	0%
Trucks	0	0	0%	386	386	7%
Motorcycles	49	49	3%	0	0	0%
Buses	20	579	31%	1	29	<1%
<b>TOTAL</b>	<b>658</b>	<b>1854</b>	<b>100%</b>	<b>5,153</b>	<b>5,323</b>	<b>100%</b>

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken July 9 and 11, 2002.

Bus data obtained from C-TRAN.

**Table A-11. October 2002 Post Opening Two-Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	HOV Lane			GP Lanes		
	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	34	34	2%	4,387	4,387	90%
Carpool: 2-person	683	1,366	63%	129	258	5%
Carpool: 3+ person	15	45	2%	0	0	0%
Vanpools	8	88	4%	0	0	0%
Trucks	0	0	0%	248	248	5%
Motorcycles	24	24	0%	0	0	0%
Buses	20	648	29%	0	0	0%
<b>TOTAL</b>	<b>784</b>	<b>2,205</b>	<b>100%</b>	<b>4,764</b>	<b>4,893</b>	<b>100%</b>

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken October 1 & 2, 2002.

Bus data obtained from C-TRAN.

**Table A-12. April 2004 Post Opening Two-Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	HOV Lane			GP Lanes		
	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons	6 to 8 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	80	80	4%	5,028	5,028	87%
Carpool: 2-person	657	1,314	60%	212	424	7%
Carpool: 3+ person	10	30	1%	0	0	0%
Vanpools	9	94	4%	0	0	0%
Trucks	0	0	0%	327	327	6%
Motorcycles	0	0	0%	0	0	0%
Buses	20	691	31%	0	0	0%
<b>TOTAL</b>	<b>776</b>	<b>2,209</b>	<b>100%</b>	<b>5,567</b>	<b>5,779</b>	<b>100%</b>

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken April 20 & 21, 2004.

Bus data obtained from C-TRAN.

**Table A-13. Baseline Peak Hour Persons by Mode for all Southbound I-5 Lanes**Measured Near 33<sup>rd</sup> Street

Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,708	2,708	74%
Carpool: 2-person	150	300	8%
Carpool: 3+ person	16	48	>1%
Trucks	278	278	8%
Motorcycles	0	0	0%
Buses	14	326	9%
<b>TOTAL</b>	<b>3,166</b>	<b>3,660</b>	<b>100%</b>

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Occupancy counts (each mode's share of total traffic) taken May 16 and 17, 2001.

Traffic counts taken in September 2001.

Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $3,660/3,166 = 1.16$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $3,334/3,152 = 1.06$

**Table A-14. November 2001 Post Opening Peak Hour Persons by Mode  
for all Southbound I-5 Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,356	2,356	63%
Carpool: 2-person	403	806	21%
Carpool: 3+ person	12	36	1%
Vanpools	4	44	1%
Trucks	195	195	5%
Motorcycles	0	0	0%
Buses	14	330	9%
TOTAL	2,984	3,767	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken in Nov. 2001.  
Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $3,767/2,984 = 1.26$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $3,473/2,970 = 1.16$

**Table A-15. March 2002 Post Opening Peak Hour Persons by Mode  
for all Southbound I-5 Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,647	2,647	66%
Carpool: 2-person	406	812	20%
Carpool: 3+ person	8	24	1%
Vanpools	4	44	1%
Trucks	140	140	4%
Motorcycles	4	4	<1%
Buses	14	310	8%
TOTAL	3,223	3,981	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken in March 2002.  
Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $3,981/3,223 = 1.24$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $3,671/3,209 = 1.14$

**Table A-16. July 2002 Post Opening Peak Hour Persons by Mode  
for all Southbound I-5 Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,514	2,514	69%
Carpool: 2-person	288	576	16%
Carpool: 3+ person	8	24	<1%
Vanpools	0	0	0%
Trucks	175	175	5%
Motorcycles	39	39	1%
Buses	14	310	9%
TOTAL	3,028	3,638	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken in July 2002.  
Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $3,638/3,038 = 1.20$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $3,328/3,024 = 1.10$

**Table A-17. October 2002 Post Opening Peak Hour Persons by Mode  
for all Southbound I-5 Lanes**

Measured Near 33<sup>rd</sup> Street

Mode	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,623	2,623	69%
Carpool: 2-person	346	692	18%
Carpool: 3+ person	5	15	<1%
Vanpools	0	0	0%
Trucks	173	173	5%
Motorcycles	16	16	<1%
Buses	9	306	8%
TOTAL	3,172	3,825	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken October 2002.  
Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $3,825/3,172 = 1.21$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $3,519/3,163 = 1.11$

**Table A-18. April 2004 Post Opening Peak Hour Persons by Mode  
for all Southbound I-5 Lanes**Measured Near 33<sup>rd</sup> Street

Mode	7:00 to 8:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	2,773	2,773	63%
Carpool: 2-person	504	1,008	23%
Carpool: 3+ person	7	21	<1%
Vanpools	9	94	2%
Trucks	165	165	4%
Motorcycles	0	0	0%
Buses	10	350	8%
TOTAL	3,468	4,411	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.  
Occupancy counts (each mode's share of total traffic) and traffic counts taken April 2004.  
Bus data obtained from C-TRAN.

Average vehicle occupancy = total number of persons/total number of vehicles  
 Average vehicle occupancy =  $4,411/3,468 = 1.27$   
 Average auto occupancy = total number of non-transit persons/total number of  
 non-transit vehicles  
 Average auto occupancy =  $4,061/3,458 = 1.17$

**Table A-19. November 2001 Post Opening Peak Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**Measured Near 33<sup>rd</sup> Street

Mode	HOV Lane			GP Lanes		
	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	16	16	2%	2,340	2,340	85%
Carpool: 2-person	295	590	58%	108	216	8%
Carpool: 3+ person	12	36	4%	0	0	0%
Vanpools	4	44	4%	0	0	0%
Trucks	0	0	0%	195	195	7%
Motorcycles	0	0	0%	0	0	0%
Buses	14	330	32%	0	0	0%
TOTAL	341	1,016	100%	2,643	2,751	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken November 13 and 14, 2001.

Bus data obtained from C-TRAN.



**Table A-20. March 2002 Post Opening Peak Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

	HOV Lane			GP Lanes		
Mode	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:15 to 7:15 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	13	13	1%	2,634	2,634	88%
Carpool: 2-person	310	620	62%	96	192	6%
Carpool: 3+ person	4	12	1%	4	12	<1%
Vanpools	4	44	4%	0	0	0%
Trucks	0	0	0%	140	140	5%
Motorcycles	4	4	<1%	0	0	0%
Buses	14	310	31%	0	0	0%
TOTAL	349	1,003	100%	2,874	2,978	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken March 20 and 21, 2002.

Bus data obtained from C-TRAN.

**Table A-21. July 2002 Post Opening Peak Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

	HOV Lane			GP Lanes		
Mode	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	21	21	3%	2,493	2,493	89%
Carpool: 2-person	221	442	54%	67	134	5%
Carpool: 3+ person	4	12	>1%	4	12	<1%
Vanpools	0	0	0%	0	0	0%
Trucks	0	0	0%	175	175	6%
Motorcycles	39	39	5%	0	0	0%
Buses	14	310	38%	0	0	0%
TOTAL	299	824	100%	2,739	2,814	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken July 9 and 11, 2002.

Bus data obtained from C-TRAN.

**Table A-22. October 2002 Post Opening Peak Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

	HOV Lane			GP Lanes		
Mode	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	16	16	2%	2,607	2,607	91%
Carpool: 2-person	298	596	63%	48	96	3%
Carpool: 3+ person	5	15	2%	0	0	0%
Vanpools	0	0	0%	0	0	0%
Trucks	0	0	0%	173	173	6%
Motorcycles	16	16	2%	0	0	0%
Buses	9	306	32%	0	0	0%
TOTAL	344	949	100%	2,828	2,876	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken October 1 & 2, 2002.

Bus data obtained from C-TRAN.

**Table A-23. April 2004 Post Opening Peak Hour Persons by Mode  
for Southbound I-5: HOV and GP Lanes**

Measured Near 33<sup>rd</sup> Street

	HOV Lane			GP Lanes		
Mode	7:00 to 8:00 AM Number of Vehicles	Total Persons	Percent of Total Persons	6:00 to 7:00 AM Number of Vehicles	Total Persons	Percent of Total Persons
Drive alone	42	42	3%	2,731	2,731	85%
Carpool: 2-person	354	708	58%	150	300	9%
Carpool: 3+ person	7	21	2%	0	0	0%
Vanpools	9	94	8%	0	0	0%
Trucks	0	0	0%	165	165	5%
Motorcycles	0	0	0%	0	0	0%
Buses	10	350	29%	0	0	0%
TOTAL	422	1,215	100%	3,046	3,196	100%

\*Note: Rounding may result in a sum of the percentages being less than or greater than 100%.

Average of occupancy counts taken April 20 & 21, 2004.

Bus data obtained from C-TRAN.

**Goal 2 Tables**

Travel times are summarized for single-occupancy vehicles and high occupancy vehicles in **Tables A-24** and **A-25**. Since there was no HOV lane in the baseline condition, it is assumed that all of the vehicles on southbound I-5 had the same travel time. Travel time by segment has been averaged over multiple observations made in each reporting period during the 6 to 8 AM period using the moving vehicle method described in the appendix of this report. The travel times were categorized for vehicles traveling on the corridor between the 99<sup>th</sup> Street interchange and the Interstate Bridge. Travel times were measured between off ramps. Note that travel time computations are based on a limited number of observations and are subject to considerable variation. The listed travel times are approximate values, not absolute numbers.

**Table A-24. Two-Hour Travel Time Results for HOV and General Purpose Users**  
**99<sup>th</sup> Street to Interstate Bridge (Average, 6-8 AM)**  
 Travel Time in Minutes per Vehicle

Travel Time: 99 <sup>th</sup> Street to Interstate Bridge (mid-point)											
		Travel Time <sup>1</sup>	Change Baseline to November	Change Baseline to March	Change November to March	Change Baseline to July	Change March to July	Change Baseline to October	Change July to October	Change Baseline to April	Change October to April
Baseline Travel Time – All Users		9.9	---	---	---	---	---	---	---	---	---
Travel Time After HOV Opening – November '01	GP <sup>2</sup> Lanes	9.1	-0.8	---	---	---	---	---	---	---	---
	HOV Lane	7.1	-2.8	---	---	---	---	---	---	---	---
Travel Time After HOV Opening – March '02	GP Lanes	10.3	---	+0.4	+1.2	---	---	---	---	---	---
	HOV Lane	6.4	---	-3.5	-0.7	---	---	---	---	---	---
Travel Time After HOV Opening – July '02	GP Lanes	9.1	---	---	---	+0.8	-1.2	---	---	---	---
	HOV Lane	7.0	---	---	---	-2.9	+0.6	---	---	---	---
Travel Time After HOV Opening – October '02	GP Lanes	8.8	---	---	---	---	---	-1.1	-0.3	---	---
	HOV Lane	7.8	---	---	---	---	---	-2.1	+0.8	---	---
Travel Time After HOV Opening – April '04	GP Lanes	13.8	---	---	---	---	---	---	---	+3.9	+5.0
	HOV Lane	6.6	---	---	---	---	---	---	---	-3.3	-1.2

<sup>1</sup> Travel time runs over three days in September 2001, four days in November-December 2001, three days in March 2002, three days in July 2002, three days in October 2002, and two days in April 2004.

<sup>2</sup> GP = General Purpose

**Table A-25. Peak Hour Travel Time Results for HOV and General Purpose Users**  
**99<sup>th</sup> Street to Interstate Bridge (Average, 6:15-7:15 AM)<sup>1</sup>**  
 Travel Time in Minutes per Vehicle

Travel Time: 99 <sup>th</sup> Street to Interstate Bridge (mid-point)											
		Travel Time <sup>1</sup>	Change Baseline to November	Change Baseline to March	Change November to March	Change Baseline to July	Change March to July	Change Baseline to October	Change July to October	Change Baseline to April	Change October to April
Baseline Travel Time – All Users		7.9	---	---	---	---	---	---	---	---	---
Travel Time After HOV Opening – Nov. '01	GP <sup>2</sup> Lanes	8.3	+0.4	---	---	---	---	---	---	---	---
	HOV Lane	7.6	-0.3	---	---	---	---	---	---	---	---
Travel Time After HOV Opening – March '02	GP Lanes	7.6	---	-0.3	-0.7	---	---	---	---	---	---
	HOV Lane	6.3	---	-1.6	-1.3	---	---	---	---	---	---
Travel Time After HOV Opening – July '02	GP Lanes	7.7	---	---	---	-0.2	+0.1	---	---	---	---
	HOV Lane	6.4	---	---	---	-1.5	+0.1	---	---	---	---
Travel Time After HOV Opening – October '02	GP Lanes	7.6	---	---	---	---	---	-0.3	-0.1	---	---
	HOV Lane	6.6	---	---	---	---	---	-1.3	+0.2	---	---
Travel Time After HOV Opening – April '04	GP Lanes	13.1	---	---	---	---	---	---	---	+5.2	+5.5
	HOV Lane	6.6	---	---	---	---	---	---	---	-1.3	0.0

Travel time runs over three days in September 2001, four days in November-December 2001, three days in March 2002, three days in July 2002, three days in October 2002, and two days in April 2004.

<sup>1</sup> Peak hour was 6:15-7:15 AM for the Baseline, November 2001, and March 2002 reporting periods. The peak hour shifted to 6:00-7:00 AM during the July 2002 and October 2002 reporting periods. The peak hour shifted to 7:00-8:00 AM during the April 2004 reporting period.

<sup>2</sup> GP = General Purpose

**Goal 3 Tables**

Tables A-26 and A-27 contain traffic data for I-5, I-205, and other parallel facilities.

**Table A-26. Facility Shares of North-South Traffic**

Measure	I-5 Share (percent)	I-205 Share (percent)	Others Share* (percent)	Total Vehicles
Two-hour period baseline share (September 2001)	37%	55%	8%	16,998
Two-hour period share, after HOV opening (November 2001)	36%	54%	10%	17,390
Two-hour period share, after HOV opening (March 2002)	37%	56%	7%	17,050
Two-hour period share, after HOV opening (July 2002)	37%	57%	6%	16,056
Two-hour period share, after HOV opening (October 2002)	38%	51%	11%	16,695
Two-hour period share, after HOV opening (April 2004)	35%	54%	11%	17,936

I-5 and "Others" measured at 99<sup>th</sup> Street. I-205 measured at Mill Plain Boulevard.

\*\*Others" include Highway 99, Hazel Dell Avenue, and Lakeshore Drive.

**Table A-27. Traffic Counts Near 33<sup>rd</sup> Street**

Measure	I-5 Count	Main Street Count*	I-5 Share (percent)	Main St. Share (percent)
Two-hour period baseline average count* (September 2001)	6,153	489	93%	7%
Two-hour period average count, after HOV opening (November 2001)	5,779	785	88%	12%
Two-hour period average count, after HOV opening (March 2002)	6,100	835	88%	12%
Two-hour period average count, after HOV opening (July 2002)	5,811	654	90%	10%
Two-hour period share, after HOV opening (October 2002)	5,547	711	89%	11%
Two-hour period share, after HOV opening (April 2004)	6,344	972	87%	13%

Measured near 33<sup>rd</sup> Street (on I-5) and south of 39<sup>th</sup> Street (Main Street).

\*Main Street southbound off ramp from I-5 was closed in the Baseline count period.

**Table A-28** provides a detailed summary of I-5 traffic counts near Jantzen Beach for the 6:00 – 8:00 a.m. period.

**Table A-28. Traffic Volumes for all Lanes on Southbound I-5**

Measured Near Jantzen Beach

Time Period	Baseline (September 2001)	After HOV Opening (November 2001)	After HOV Opening (March 2002)	After HOV Opening (July 2002)	After HOV Opening (October 2002)	After HOV Opening (April 2004)
5:00-6:00 a.m.	2,222	2,276	2,368	2,448	3,010	2,943
6:00-7:00 a.m.	4,166	4,113	4,284	3,985	4,711	4,673
7:00-8:00 a.m.	4,124	4,103	4,313	3,934	4,504	4,530
8:00-9:00 a.m.	3,773	3,558	3,017	3,347	3,386	3,845
Total 6-8 a.m.	8,290	8,216	8,597	7,919	9,215	9,203
Total 5:00-9:00 a.m.	14,285	14,050	13,982	13,714	15,611	15,991

Traffic counts taken in September 2001, November 2001, March 2002, July 2002, October 2002 and April 2004.

**Table A-29** provides a detailed summary of southbound I-5 traffic counts for the 5:00 – 9:00 a.m. period.

**Table A-29. Traffic Volumes for all Lanes on Southbound I-5**

Measured Near 33<sup>rd</sup> Street

Time Period	Baseline (September 2001)	After HOV Opening (November 2001)	After HOV Opening (March 2002)	After HOV Opening (July 2002)	After HOV Opening (October 2002)	After HOV Opening (April 2004)
5:00-6:00 a.m.	1,599	1,733	1,615	1,925	1,848	1,958
6:00-7:00 a.m.	3,036	2,934	3,072	3,039	3,171	2,870
7:00-8:00 a.m.	3,117	2,845	3,028	2,771	2,376	3,473
8:00-9:00 a.m.	2,837	3,073	3,071	3,002	3,284	3,559
Total 6:00-8:00 a.m.	6,153	5,779	6,100	5,810	5,547	6,343
Total 5:00-9:00 a.m.	10,589	10,585	10,786	10,737	10,680	11,860

Traffic counts taken in September 2001, November 2001, March 2002, July 2002, October 2002 and April 2004.

**Table A-30** provides a detailed summary of southbound I-205 traffic counts for the 5:00-10:00 a.m. period.

**Table A-30. Traffic Volumes for all Lanes on Southbound I-205**

Measured Near Mill Plain Boulevard

Time Period	Baseline (September 2001)	After HOV Opening (November 2001)	After HOV Opening (March 2002)	After HOV Opening (July 2002)	After HOV Opening (October 2002)	After HOV Opening (April 2004)
5:00-6:00 a.m.	1,799	1,725	1,751	1,938	1,789	1,867
6:00-7:00 a.m.	4,033	4,052	4,155	4,103	4,096	4,279
7:00-8:00 a.m.	5,294	5,376	5,347	5,212	4,871	5,392
8:00-9:00 a.m.	4,128	4,131	4,174	3,909	4,270	4,143
Total	15,254	15,284	15,427	15,162	15,062	15,681

Traffic counts taken in September 2001, November 2001, March 2002, July 2002, October 2002 and April 2004.





**Goal 4 Tables**

**Table A-31** shows the persons in carpools, vanpools, and transit before and after HOV opening. The after HOV opening persons are reported for I-5 users regardless of which lane they are using.

**Table A-31. Two-Hour Persons in Carpools, Vanpools, and Transit on I-5**

Mode	Baseline Persons	After HOV Opening (November 2001)		After HOV Opening (March 2002)		After HOV Opening (July 2002)		After HOV Opening (October 2002)		After HOV Opening (April 2004)	
		All Through Lanes	HOV Lane Only	All Through Lanes	HOV Lane Only	All Through Lanes	HOV Lane Only	All Through Lanes	HOV Lane Only	All Through Lanes	HOV Lane Only
Carpools & Vanpools	738	1,905	1,252	1,695	1,294	1,467	1,188	1,757	1,499	2,107	1,438
Transit	490	555	555	553	553	579	579	648	648	669	669
TOTAL	1,228	2,460	1,807	2,248	1,847	2,046	1,767	2,405	2,147	2,553	2,129

Baseline is from September 2001.

After HOV Opening is from November 2001, March 2002, July 2002, November 2002, and April 2004.

**Goal 5 Tables**

Tables A-32 through A-37 contained detailed incident management information for each reporting period.

**Table A-32. Baseline Three-Hour Incident Management Call-Outs**

WSP Call-Outs	WSDOT Incident Response Vehicle Call-Outs
<u>On Roadway Incidents</u> 4 property damage collisions 3 blocking disabled vehicles 2 traffic hazard reports	<u>On Roadway Incidents</u> 1 property damage collision
<u>Off-Roadway Incidents</u> 2 abandoned non-blocking vehicles 1 disabled non-blocking vehicle	<u>Off-Roadway Incidents</u> 0 Off-Roadway incidents

September 2001 data (I-5 SB 6 to 9 AM).

**Table A-33. November 2001 Post Opening Three-Hour Incident Management Call-Outs**

WSP Call-Outs	WSDOT Incident Response Vehicle Call-Outs
<u>On Roadway Incidents</u> 5 property damage collisions 7 blocking disabled vehicles 0 traffic hazard reports	<u>On Roadway Incidents</u> 0 property damage collisions
<u>Off-Roadway Incidents</u> 0 abandoned non-blocking vehicles 0 disabled non-blocking vehicles	<u>Off-Roadway Incidents</u> 0 Off-Roadway incidents

October 29 - November 16, 2001 data (I-5 SB 6 to 9 AM)

**Table A-34. March 2002 Post Opening Three-Hour Incident Management Call-Outs**

WSP Call-Outs	WSDOT Incident Response Vehicle Call-Outs
<u>On Roadway Incidents</u> 2 property damage collisions 3 blocking disabled vehicles 0 traffic hazard reports	<u>On Roadway Incidents</u> 1 property damage collision 1 blocking disabled vehicle
<u>Off-Roadway Incidents</u> 2 abandoned non-blocking vehicles 4 disabled non-blocking vehicles	<u>Off-Roadway Incidents</u> 1 Off-Roadway incident

March 11 – March 29, 2002 data (I-5 SB 6 to 9 AM).

**Table A-35. July 2002 Post Opening Three-Hour Incident Management Call-Outs**

<b>WSP Call-Outs</b>	<b>WSDOT Incident Response Vehicle Call-Outs</b>
<u>On Roadway Incidents</u> 2 property damage collisions 1 blocking disabled vehicles 0 traffic hazard reports	<u>On Roadway Incidents</u> 1 property damage collision 1 blocking disabled vehicle
<u>Off-Roadway Incidents</u> 1 abandoned non-blocking vehicle 4 disabled non-blocking vehicles	<u>Off-Roadway Incidents</u> 2 abandoned non-blocking vehicle 10 disabled non-blocking vehicles

July 1 – 19, 2002 data (I-5 SB 6 to 9 AM).

**Table A-36. October 2002 Post Opening Three-Hour Incident Management Call-Outs**

<b>WSP Call-Outs</b>	<b>WSDOT Incident Response Vehicle Call-Outs</b>
<u>On Roadway Incidents</u> 4 property damage collisions 2 blocking disabled vehicles 0 traffic hazard reports	<u>On Roadway Incidents</u> 2 property damage collisions 2 blocking disabled vehicles 1 blocking debris
<u>Off-Roadway Incidents</u> 0 abandoned non-blocking vehicle 9 disabled non-blocking vehicles	<u>Off-Roadway Incidents</u> 6 abandoned non-blocking vehicle 10 disabled non-blocking vehicles

September 23 – October 11, 2002 data (I-5 SB 6 to 9 AM).

**Table A-37. April 2004 Post Opening Three-Hour Incident Management Call-Outs**

<b>WSP Call-Outs*</b>	<b>WSDOT Incident Response Vehicle Call-Outs</b>
<u>On Roadway Incidents</u> 7 property damage collisions N/A blocking disabled vehicles N/A traffic hazard reports	<u>On Roadway Incidents</u> 0 property damage collisions 0 blocking disabled vehicles 0 blocking debris
<u>Off-Roadway Incidents</u> N/A abandoned non-blocking vehicle N/A disabled non-blocking vehicles	<u>Off-Roadway Incidents</u> 1 abandoned non-blocking vehicle 2 disabled non-blocking vehicles

April 12 – April 30, 2004 data (I-5 SB 6 to 9 AM).

\*WSP provided limited call-out data for the April 2004 reporting period.

**Goal 6 Tables**

Tables A-38 through A-41 contain observed violation rate data and enforcement data.

**Table A-38. April 2004 HOV Lane Observed Violation Rates**

Using Vehicle Occupancy Counts

Mode	Two-Hour Percent of Total Vehicles	Peak Hour Percent of Total Vehicles
Drive alone	11%	11%
Eligible Vehicles	89%	89%
TOTAL	100%	100%
<i>OBSERVED VIOLATION RATE</i>	11%	11%

Calculations shown include spreadsheet rounding. Average of occupancy counts taken April 2004.

**Table A-39. Peak Hour HOV Lane Observed Violation Rates**

Using Vehicle Occupancy Counts

Reporting Period	Two Hour Observed Violation Rate	Peak Hour Observed Violation Rate
November 2001	5%	5%
March 2002	5%	4%
July 2002	6%	8%
October 2002	5%	5%
April 2004	11%	11%

Calculations shown include spreadsheet rounding. Average of occupancy counts taken March 20 and 21, 2001, November 13 and 14, 2001, July 9 and 11, 2002, October 1 and 2, 2002, and April 20 and 21, 2004.

Table A-40. Weekly Enforcement Data

Category	November 2001 Weekly Average	March 2002 Weekly Average	July 2002 Weekly Average	October 2002 Weekly Average	April 2004 Weekly Average*	Weekly % Change Nov to March	Weekly % Change March to July	Weekly % Change July to October	Weekly % Change October to April
HOV citations	7	12	2	3	7	+71%	-83%	+50%	+133%
HOV warnings	25	6	3	6	1	-76%	-50%	+100%	-83%
Seat belt violations	4	2	3	3	13	-50%	-50%	0%	+333%
No insurance	8	1	0	1	12	-88%	-100%	+100%	+1100%
Tows	2	0	0	0	NA	-100%	0%	0%	NA
# Car officers	9	9	5	5	NA	0%	-44%	0%	NA
# M/C officers	12	6	4	4	NA	-50%	-33%	0%	NA
# Enforcement hours	11	9	6	8	8	-18%	-33%	+33%	0%

\*WSP provided limited enforcement data for the April 2004 reporting period.

Table A-41. Daily Enforcement Data

Category	November 2001 Daily Average	March 2002 Daily Average	July 2002 Daily Average	October 2002 Daily Average	April 2004 Daily Average*	Daily % Change Nov to March	Daily % Change March to July	Daily % Change July to October	Daily % Change October to April
HOV citations	1	3	0	1	1	+200%	-100%	+100%	0%
HOV warnings	5	1	1	1	0	-80%	0%	0%	-100%
Seat belt violations	1	1	1	1	3	0%	0%	0%	+200%
No insurance	2	0	0	0	2	-100%	0%	0%	+200%
Tows	1	0	0	0	NA	-100%	0%	0%	NA
# Car officers	1.9	1.9	1.1	1.0	NA	0%	-42%	-10%	NA
# M/C officers	2.5	1.2	0.9	0.9	NA	-52%	-25%	0%	NA
# Enforcement hours	2.3	1.9	1.3	1.6	1.6	-17%	-32%	+23%	0%

\*WSP provided limited enforcement data for the April 2004 reporting period.

## **APPENDIX B**

## APPENDIX B

### **Travel Time Methodology**

The following is the methodology used for conducting travel time studies of the corridor. These were used to establish baseline conditions and will be used for the evaluation data collection.

1. Travel time runs begin at approximately 6 AM and end at approximately 8 AM.
2. If there is an incident such as bad weather, construction, maintenance, or an accident that affects traffic, note it and continue the study. Note the weather, date, day of week, and time of the run. It is desirable that this be done at the beginning of each run.
3. Try to travel at the median speed. As necessary, pass slow moving vehicles and allow fast moving vehicles to pass, but try to make sure that an equal number of vehicles pass as are passed.
4. At each checkpoint, note the time. If the location gets cut off it can be deduced from the previous location by its order. If the time gets cut off and it cannot be figured out, the run will need to be repeated another day.